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* General studies, see also individual crops.

Plant Breeding Abstracts.

Vol. XV, No. 2

Part I. Empire Section

*STATISTICS 519

418. BHATTACHARYYA, B. C. 519.24
On an aspect of Pearsonian system of curves and a few analogies.
Sankhyā : Indian J. Statist. 1944 : **6** : 415–18.
By taking simple functions, such as sums, products, and quotients, of variables following the familiar χ^2 distribution, we may reproduce many of the Pearson curves, and also several new types, including Bessel functions, which might be suitable for graduation. C. A. B. S.

419. HSU, P. L. 519.24
Some simple facts about the separation of degrees of freedom in factorial experiments.
Sankhyā : Indian J. Statist. 1943 : **6** : 253–54.
Simple expressions are given for the sums of squares for main effects and interactions in factorial experiments, using matrix methods. C. A. B. S.

420. NAIR, K. R. 519.24
Efficiency of the adjustment for concomitant characters in biological experiments.
Sankhyā : Indian J. Statist. 1942 : **6** : 167–74.
Analysis of covariance is often used to improve the accuracy of an experiment by correcting for causes of variation which are not easily eliminated. The conditions under which this method is suitable are studied. Examples are used to show that the accuracy may actually be diminished when the conditions are not fulfilled. C. A. B. S.

421. NAIR, K. R. and SHRIVASTAVA, M. P. 519.24
On a simple method of curve fitting.
Sankhyā : Indian J. Statist. 1942 : **6** : 121–32.
A simple method of fitting a straight line to a set of plotted points is to divide them into three consecutive groups, as nearly as possible equal in number, then to find the centres of mass of the first and third groups, and join them by a straight line. For fitting a parabola, the points are similarly divided into five equal groups, and the curve drawn through the mean points of the first, third, and fifth groups. The efficiency of this method is compared with that of fitting by least squares, and is found generally to be from 60 to 90%. C. A. B. S.

422. RAMAMURTI, B. and SITARAMAN, B. 519.24
On maximal sets of confounded interactions in a $(2^n, 2^k)$ confounded design.
Sankhyā : Indian J. Statist. 1942 : **6** : 183–88.

BHATTACHARYYA, A.
A note on Ramamurti's problem of maximal sets.
Ibid. 1942 : **6** : 189–92.
In a confounded factorial experiment it is desirable that the interactions confounded shall be of as high an order as possible. Ramamurti and Sitaraman show how such an experiment may be designed when each treatment occurs at two levels only. Bhattacharyya continues the discussion, with a generalization to any fixed number of levels. C. A. B. S.

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* General studies, see also individual crops.

423. SUKHATME, P. V. 519.24
Moments and product moments of moment-statistics for samples of finite and infinite populations.
Sankhyā : Indian J. Statist. 1944 : **6** : 363–82.
A tabulation is given of all the moments of the sample moments about the mean in terms of the distribution moments about the mean, up to and including the 8th order. C. A. B. S.

424. BHATTACHARYYA, K. N. 519.24:631.421
A note on two-fold triple systems.
Sankhyā : Indian J. Statist. 1943 : **6** : 313–14.
It is always possible to construct a balanced incomplete block design such that each block contains 3 plots, and every pair of treatments occurs in the same block just twice, provided that, if v and b are the numbers of varieties and blocks respectively, $(v-1)/2 = 3b/v =$ an integer.
C. A. B. S.

425. NAIR, K. R. 519.24:631.421
Certain inequality relationships among the combinatorial parameters of incomplete block designs.
Sankhyā : Indian J. Statist. 1943 : **6** : 255–59.
An incomplete block design has b blocks of k plots each in which v varieties (or treatments) are replicated each r times. Inequality relations among the parameters b, k, v, r rule out many designs as impossible. For completely balanced designs in which every pair of varieties occur together in just λ blocks, Fisher showed that $b \geqslant v$, while if the design is resolvable, i.e. the blocks can be grouped into sets each of which is a complete replication, Bose showed that $b \geqslant v + r - 1$. These and more stringent inequalities are proved, and the discussion extended to "partially balanced designs", for which we may have $v \geqslant b$, with advantages to the experimenter. C. A. B. S.

426. NAIR, K. R. 519.24:631.421
The recovery of inter-block information in incomplete block designs.
Sankhyā : Indian J. Statist. 1944 : **6** : 383–90.
"In agricultural field experiments it has been found that unless the field is very heterogeneous, the adoption of incomplete block designs leads to inefficient estimates of the treatment differences, if the whole of the apparent block differences is eliminated from such estimates. When the fertility differences between blocks are not big, the efficiency of the estimates of treatment differences can be improved by pooling the intra-block and inter-block information. The process of doing this has been worked out for partially balanced incomplete block designs, of which the quasi-factorial and confounded designs are special cases. The situation when some plots of these designs are missing has also been discussed". [Author's summary.]

*BREEDING 575

427. SABNIS, T. S. 575:633
Progress of botany with special reference to economic plants.
Proc. 31st Indian Sci. Congr., Delhi 1944 : Pt II : 60–73.
Work done in India and abroad is reviewed under the following heads: plant breeding and genetics, plant geography, plant ecology, photoperiodism, vernalization, growth hormones, role of secondary elements, hydroponics, and plant diseases. B. P. P.

428. 575:633(54.5)
Annual report of the Imperial Council of Agricultural Research for 1942–43.
New Delhi 1943 : Pp. 38.
Wheat
Hybridization between the best hill wheats and varieties known to be rust resistant is in progress. Well known varieties from Europe, America, Australia and Africa, and a valuable collection of the indigenous wheats of Afghanistan, are being maintained and studied along with improved varieties from provinces and States. A co-ordinated study of resistance of promising wheats and barleys in relation to all physiological races of black rust is being undertaken at four stations. Work on the control of foci of infection in the hills is progressing.
A further rust testing scheme is being carried out in Peninsular India.

* General studies, see also individual crops.

Millet
In work on resistance to *Striga*, four Indian varieties, Bilichigan, Muddinandyal, Mallewari and Agia Kodal have shown promise of resistance to *Striga lutea* under certain conditions; two varieties from Burma have also shown high resistance to the same species.

Rice
Hybridization of fixed varieties with purple pigmentation has been achieved. These varieties can be readily distinguished from wild rices which can be weeded out in the early stages of growth. At Nagina, an important achievement was the combination of the protective sheath character of the coarse Sathi parent with the quality types of rice: it is hoped to impart to the improved quality strains the resistant character of Sathi to an important insect pest, known locally as Gundhi. Under the Kashmir rice research scheme, successful crosses have been made between the predominant Kashmir types and early maturing and disease-resistant Russian varieties.

Potato
Interspecific and intervarietal hybridization work has been carried out with a view to obtaining high yielding varieties resistant to early and late blights and virus diseases.

Pulses
Work is in progress which aims at the production of high yielding, disease and drought resistant strains of gram, urid, mung, kulthi, tur and other pulses.

429. 575:633(66.7)

Annual report of the Botanical Division, Department of Agriculture, Ashanti for 1943–44.
1944 : Pp. 4.

The work reported includes cassava breeding, yam trials, cereal breeding, the production of seeds and seedlings of European vegetables and testing of imported varieties, the collection of types of native vegetables and the selection and maintenance of seed supply of improved types, and varied work in connexion with miscellaneous crops such as *Pyrethrum* and *Urena lobata*.

430. 575:633(67·8)

Specialist and research work of the Department of Agriculture, Tanganyika Territory 1943 : Pp. 35. (Mimeographed).

Cotton
Selection for lint quality and resistance to jassids continues, and fears that these two characters are incompatible have proved to be groundless.

Sisal
The hybrid *Agave amaniensis* x *A. angustifolia* has been selfed, back-crossed to *A. amaniensis* and crossed with *A. horrida*. The following useful characters have appeared in the hybrid progenies: high leaf number (up to 700), heavy leaves, long leaves and thornlessness.

431. 575:633(94)

Seventeenth annual report of the Council for Scientific and Industrial Research, for the year ended 30th June, 1943.
Canberra 1944 : Pp. 76.

Perennial veldt grass
This accidental introduction from South Africa which flourishes on poor coastal sands has been observed to be extremely palatable. A wide range of superior plant types has been selected. The character for non-shedding of seed has been proved to be a single recessive.

Alfalfa
It is proposed to transfer immunity to rust from other varieties to Australian lucernes.

Subterranean clover
Selected lines from the cross Wenigap x Tallarooh are resistant to rust. Study of an F_2 population from the cross Mt Barker x Mulwata indicates that resistance is inherited on a simple Mendelian basis, susceptibility being dominant.

Potato
Development of varieties resistant to viruses, A, X, Y, and leaf roll has been continued.

*GENETICS 575.1

432. KOSAMBI, D. D. 575.116.4:519.24
The estimation of map distances from recombination values.
Ann. Eugen. 1944 : **12** : 172–75.

The formula $y_{12} = \frac{y_1 + y_2}{1 + 4y_1y_2}$ is recommended for the calculation of map distances from recombination values. It is derived by assuming that $\rho = 4y$ in Haldane's formula $\frac{dy}{dx} = 1 - \rho y$.

433. FISHER, R. A. 575.22
Allowance for double reduction in the calculation of genotype frequencies with polysomic inheritance.
Ann. Eugen. 1944 : **12** : 169–71.

An algebraic treatment is presented of the problem of determining genotype when double reduction is not negligible, with special reference to tristylic species.

ORIGIN OF SPECIES 576.1

434. CAVE, A. J. E. and
HAINES, R. W. 576.12
Meristic variation and reversibility of evolution.
Nature, Lond. 1944 : **154** : 579–80.

After describing an instance of meristic reversion drawn from the comparative anatomy of the mammalian skeleton, the authors suggest that Dollo's "law of irreversibility" should be amended to make clear that, in the case of structures constituting a series, the law applies to the series as a whole, and not to the individual members thereof.

435. BOND, T. E. T. 576.12:9
Robert Wight (1796–1872), Dr Freke and the "Origin of Species".
Nature, Lond. 1944 : **154** : 566–69.

A brief review is given of the ideas on evolution discussed in four letters of Robert Wight to Dr Freke. These throw some light on the state of the Darwinian controversy around 1860, also on Freke's pre-Darwinian evolutionary theories.

*CYTOLOGY 576.3

436. SMITH, S. G. 576.35
The reproduction of the nucleus.
Sci. Agric. 1944 : **24** : 491–509.

A brief account is given of mitosis and meiosis, also of somatic pairing in the *Diptera*, which is believed to constitute a connecting link between the two first mentioned processes.

437. THOMAS, P. T. 576.356.5:581.04
Plant improvement by use of drugs.
Market Gr., Lond. Pp. 2.

This article describes the use of colchicine and acenaphthene for the production of polyploids.

SEXUALITY 577.8

438. SKOLKO, A. J. 577.8:632.472.3
A cultural and cytological investigation of a two-spored basidiomycete, *Aleurodiscus canadensis* n. sp.
Canad. J. Res. 1944 : **22** : Sect. C : 251–71.

A case of "apparent" homothallism is described for the species *A. canadensis*. There are two nuclei in the basidiospores and these probably carry different allelomorphic compatibility factors, the combination being fertile. Occasional anomalous heterothallic strains are produced and it is believed that these originate from aberrant uninucleate spores. This "apparent" homothallism is intermediate between normal homothallism and heterothallism.

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* General studies, see also individual crops.

MICROSCOPIC TECHNIQUE 578.6

439. LINFOOT, E. H. 578.6
Phase difference microscopy.
Nature, Lond. 1945 : **155** : p. 76.

"Interesting new possibilities in the preparation of phase-contrast configurations, for example disks and strips, have lately been opened up by the development of the modern technique of controlled evaporation *in vacuo*. By this process, a transparent layer can be deposited on a thin glass plate of such a thickness as to increase by one quarter of a wave-length the retardation of yellow light passing through the plate. By drawing a fairly sharp stylus across this layer, we can remove the soft coating from a narrow strip of the glass without damaging the glass surface. The result is a 'phase-advancing strip' which can be used for phase-contrast testing".

BOTANY 58

440. ROSE, P. G. 58.006(49.3)
The Botanic Garden, Brussels.
Gdnrs' Chron. 1944 : **116** : 228–29.

A recent description is given of the Botanic Garden, Brussels, which has apparently remained intact.

441. SPRAGUE, M. L. 582:001.4
A discussion on the differences in observance between zoological and botanical nomenclature.
Proc. Linn. Soc. Lond. 1943–44 (1944) : **156** : 126–46.

The question of the advisability of modifying the existing rules of botanical and zoological nomenclature in order to bring the two conventions into line in discussed, the general feeling being against any such unification. Those taking part were M. L. and T. A. Sprague, F. Hemming, A. J. Wilmott, E. Trewavas, S. Neave and P. de Laszlo.

442. H....., F. 631.8:575
The plant breeder and the soil.
Trop. Agriculture, Trin. 1944 : **21** : 181–83.

It is suggested that breeding for high yield is dependent principally on the production of genotypes capable of utilizing efficiently the available soil nitrogen.

*PLANT DISEASES AND PESTS 632

443. FLOREY, H. W. 632.421.2:581.6:575.42
Penicillin.
J.R. Soc. Arts 1944 : **92** : 652–58.

Reference is made to Coghill's work in the selection of strains of *Penicillium notatum* producing a high yield of penicillin.

444. HALDANE, J. B. S. and
WHITEHOUSE, H. L. K. 632.421.9:575.114
Symmetrical and asymmetrical post-reduction in ascomycetes.
Nature, Lond. 1944 : **154** : p. 704.

Asymmetrical post-reduction appears to be more frequent than symmetrical post-reduction in the case of certain genes at least in *Neurospora sitophila* and *Bombardia lunata* but not in *N. crassa*. This greater frequency of asymmetrical segregations could be explained on the assumption that the relative position of the chromatids remains unaltered during interphase.

ECONOMIC PLANTS 633

445. SINGH, H. B. 633–2.111–1.521.6(54.5)
Effect of frost on some economic plants of Delhi.
Indian J. Agric. Sci. 1943 : **13** : 279–82.

The effect of a severe frost on a number of plants is described. Among those severely damaged were early-sown wheat, pigeon peas, sugar cane, tobacco, rozelle, chillies, castor-oil plant, brinjal, tomato, potatoes; also fruit trees, such as guavas, figs, plantains and papayas. Lentils, lucerne, spinach, beet, and citrus fruits appeared to be resistant. B. P. P.

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* General studies, see also individual crops.

CEREALS 633.1

446. BROOKS, F. T. 633.1–2.452–1.521.6:576.16:575
Biologic specialization in the cereal rusts.
Ann. Appl. Biol. 1944 : **31** : 362–66.

The physiological races of *P. graminis, P. triticina, P. glumarum, P. anom ala* and *P. coronata* are described, with reference to investigations in North America, German y and other countries. Attention is drawn to the difficulties encountered in the determin ation of the physiological races, and in view of the extreme biological specialization in the cereal rusts it is doubted whether further study along previous lines will be profitable except in particular instances, especially in relation to plant breeding programmes. It is pointed out that the situation from the standpoint of the breeder is, however, alleviated by the fact that many of the races behave as single groups in the field, and by the discovery of mature plant resistance to many races. Work has on the other hand made it clear that the rusts are still liable to change by hybridization and gene mutation. The position can then only be safeguarded by continued co-operation between pathologist and plant breeder.

WHEAT 633.11

447. SHARMAN, B. C. 633.11:575.116.1.061.6
'Coloured anthers'- A new monofactorial character in wheat, T. *vulgare*, Host.
Nature, Lond. 1944 : **154** : p. 675.

A new gene, *Ca*, is described which determines purple anther coloration during anthesis. The distinction between the purple and the normal yellow anthers (*ca ca*) is difficult to ascertain after the pollen has been shed. The gene pair *Ca ca* is not linked with *K*[s] *k*.

448. MORAN, T. 633.11:577.16:664.641.016(42.59)
Report on the quality—for bread-making purposes—of wheat harvested in 1939 at the headquarters and sub-stations of the National Institute of Agricultural Botany.
J. Nat. Inst. Agric. Bot. 1944 : **5** : 9–27.

Data are given on the baking quality and vitamin B_1 content of a series of wheats suitable for growing in England.

449. 633.11:581.143.26.035.1
KAR, B. K. 633.13:581.143.26.035.1
Vernalization of Indian crops. II. Photostage in wheat (*Triticum vulgare*) and oat (*Avena* sp.).
Proc. 31st Indian Sci. Congr., Delhi 1944 : Pt III : 87–88. (Abst.).

Two wheat varieties, I.P.4 and I.P.52, when exposed to long day treatment, for 15 days, were 24 days earlier than the control. Similar treatment of an oat variety (I.P.1) resulted in 43 days advance. The results are briefly discussed. B. P. P.

BUCKWHEAT 633.12

450. SACHAROV, V. V.,
FROLOVA, S. L. and
MANSUROVA, V. V. 633.12:576.356.5:581.04:581.162.5
High fertility of buckwheat tetraploids obtained by means of colchicine treatment.
Nature, Lond. 1944 : **154** : p. 613.

Tetraploid strains have been produced by colchicine treatment of the following buckwheat varieties: Bolshevik, Kharkovskaya, Bogatyr, BTSKA, Altaiskaya, Ispanskaya, Serebristaya, Kazakskaya, Belorusskaya and Buriat-Mongolskaya. The tetraploids exhibit a marked increase in seed size, and, although in general this is accompanied by a decrease in fertility, it has been possible to develop highly fertile lines by means of selection.

OATS 633.13

451. PATEL, N. M. 633.13–2.451.2–1.521.6:575.11
Dimeric transmission of disease resistance to *Ustilago Avenae* (Pers.) Jens. Race 21 (Reed) in *Avena* hybrid of interspecific derivation.
Proc. 31st Indian Sci. Congr., Delhi 1944 : Pt III : 157–58. (Abst.).

In a cross between series 1060 Lot–44 L.W. (susceptible) and Smut Resistant (Cornell)–6, the F_1 showed resistance to the invasion of *U. Avenae*, while in F_2 a ratio of 15 resistant : 1 susceptible

was obtained. It is concluded that Series 1060 carries two pairs of recessive genes ($r_1\ r_1\ r_2\ r_2$) and Smut Resistant (Cornell)–6 contains the two dominant alleles ($R_1\ R_1\ R_2\ R_2$). B. P. P.

452. NEWTON, M. and JOHNSON, T. 633.13–2.452:576.16:631.521.6:575.242

Physiologic specialization of oat stem rust in Canada.

Canad. J. Res. 1944 : **22** : Sect. C : 201–16.

A general account of the physiological specialization of *Puccinia graminis Avenae* Erickss. et Henn. is given, and the relative importance of the 12 races so far recognized discussed. New races may arise through hybridization and subsequent segregation on *Berberis* spp. and also by mutation. An example of recurrent mutation from race 3 to race 7 is quoted.

453. PETURSON, B. 633.13–2.452–1.521.6

Adult plant resistance of some oat varieties to physiologic races of crown rust.

Canad. J. Res. 1944 : **22** : Sect. C.: 287–89.

"The reactions of five varieties of oats in the seedling and adult plant stages to seven physiologic races of crown rust, *Puccinia coronata* Corda var. *Avenae* Erikss. & Henn. were determined.

"All five varieties were completely susceptible in the seedling stage to all the races. Two varieties, Erban and Ajax, were resistant in the adult plant stage to some of the races and susceptible or moderately susceptible to others. Two other varieties, R.L. No. 1370 and R.L. No. 1510, were resistant in the adult plant stage to all the races used in this test, and apparently possess a generalized type of adult plant resistance to crown rust". [Author's summary.]

BARLEY 633.16

454. MEREDITH, W. O. S. and SALLANS, H. R. 633.16:581.6

Varietal differences in barleys and malts. XIII. Wort attenuation, viscosity, and turbidity, and their inter-relations.

Canad. J. Res. 1943 : **21** : Sect. C : 351–62.

"Determination of degree of attenuation, viscosity, turbidity at filtration after 24 hours were made on the worts from 144 malts representing 24 barley varieties grown in 1938 at each of six widely scattered points in Canada.

"Varietal and station differences are demonstrated in these wort qualities. *O.A.C.* 21, Mensury, and Olli, acceptable malting varieties, produce worts that are high in degree of attenuation, low in viscosity, and low in turbidity. Two other six-rowed varieties, Brandon 216 and Velvet, are similar to *O.A.C.* 21 in wort qualities. The remaining 14 six-rowed varieties are deficient in at least one wort quality. Among five two-rowed varieties, Hannchen being used as standard, Rex and Sanalta are similar to Hannchen in the three wort properties, and Charlottetown 80 and Victory are deficient in one or more.

"Intervarietal relations between the wort properties were examined".

455. BELL, G. D. H. 633.16–2.111–1.521.6:575.12(42.59)

The breeding of two-row winter-hardy barley.

J. Agric. Sci. 1944 : **34** : 223–38.

The nature and occurrence of winter hardiness among barley varieties is discussed, together with an account of its genetical determination and its association with other characters such as prostrate juvenile growth habit and dark green leaf coloration. A description then follows of the Cambridge breeding programme for the production of winter-hardy barleys, the winter-hardy, six-row, continental varieties Tschermak's Two-Row Winter Barley and Stadler's A having been crossed with the principal British spring barleys The new winter-hardy Pioneer, from Tschermak's Two-Row Barley x Spratt-Archer, is mentioned (cf. "Plant Breeding Abstracts", Vol. XIV, Abst. 39). A final section discusses the value of the winter barleys Carstens, Hungarian and Probstdorf, only the first being of much promise for breeders in Great Britain Hybridization of these varieties *inter se*, and between them and various spring varieties has been effected.

456. 633.16–2.111–1.521.6:581.6:575.12(42)

Prefect six-row winter barley.

Leafl. Nat. Inst. Agric. Bot., Cambridge 1944 : Pp. 2.

The new six-row winter barley, Prefect, is described. It was produced by G. D. H. Bell, of the Cambridge University Plant Breeding Institute, from a cross of Praecox x Spratt-Archer, and combines the winter-hardiness of the former parent with many of the desirable agronomic and malting characteristics of the latter.

457. DAVE, B. B. 633.18:575(54.3)
Improved rice strains in the Central Provinces.
Indian J. Agric. Sci. 1943 : **13** : 479–88.

A brief account is given of the recent rice breeding work in the Central Provinces. Very detailed descriptions are given of the 16 improved strains which have been obtained as a result of this work. B. P. P.

458. 633.18:575.42(54.8)
Administration report of the Department of Agriculture. 1118 M.E.
Trivandrum 1944 : Pp. 39.

The following items of interest to plant breeders are recorded: (1) improvement of paddy by selection for drought resistance, high yield and earliness; (2) the introduction of promising varieties of paddy from other parts of India; and (3) mass selection.

459. HEDAYETULLAH, S. and
CHAKRAVORTY, A. K. 633.18:581.4
A comparative study of the mechanical system in five species of the genus *Oryza*.
J. Dep. Sci., Calcutta 1941 : **1** : 21–28.

A comparative study of the cauline mechanical tissue of *Oryza* spp. is presented.

FORAGE GRASSES 633.2

460. STEWART, W. A.,
JENKIN, T. J. and
LINDSAY, J. A. 633.2/3:575
Green pastures. IV. Grass breeding and seed production.
J. Minist. Agric. 1944 : **51** : 407–09.

This account of a broadcast discussion includes items of information relating to the general principles of breeding pasture plants.

461. HILLS, K. L. 633.263:575.11
Material for testing isolation efficiency in perennial rye grass.
J. Aust. Inst. Agric. Sci. 1942 : **8** : p. 170.

Complementary factors are involved in the production of red colour in the base of the tiller sheath of *L. perenne* L. This note draws attention to the value of the non-red sheath base as a means of testing the efficiency of methods of isolation, as it may be assumed that free floating pollen is of the double homozygous dominant type for red base colour.

ROOTS AND TUBERS 633.4

462. THOMPSON, E. G. 633.416:581.6 (42.59)
Mangold trials, 1936–38.
J. Nat. Inst. Agric. Bot. 1944 : **5** : 28–44.

Trials of 29 mangold varieties are reported; the characters studied included yield, number of roots, percentage of dry matter and keeping quality.

463. CARSON, G. P. and
HOWARD, H. W. 633.491:581.143.26:575.1
Inheritance of the "bolter" condition in the potato.
Nature, Lond. 1944 : **154** : p. 829.

Root-tip counts of "bolter" plants of the varieties Gladstone and Ulster Chieftain showed that the chromosome number was $2n = 48$ and was identical with that of normal plants of the varieties.

Crosses were made of Gladstone "bolter" ♀ x Flourball ♂, Gladstone ♀ x Flourball ♂, and U.S.D.A. seedling 41956 ♀ x Flourball ♂, and percentages of resulting plants with underground parts that could be described as cultivated, somewhat wild, wild, or very wild were recorded. Crossings of normal plants had similar percentages of plants in the four groupings of underground parts, but the family from the "bolter" Gladstone differed in having fewer plants in the cultivated groups and more plants in the three wild groups. Evidence was thus obtained that the "bolter" Gladstone differs in being genetically "wilder" than normal Gladstone.

464. Pal, B. P. and Pushkarnath. 633.491:581.162.5:575.11
Self- and cross- incompatibility in some diploid species of *Solanum*.
Curr. Sci. 1944 : **13** : 235–36.

Eleven allelomorphic *S* genes have now been investigated which determine cross-compatibility in the species *S. Caldasii*, *S. subtilius* and *S. chacoense*. *S* genes are also present in *S. Aracc-papa* and *S. Rybinii*, but in these cases compatibility appears to be less simply determined.

465. 633.491:582:001.4(42)
Salaman, R. N. 633.491–2.412.5–1.521.6(42)
Report of the Potato Synonym Committee of the National Institute of Agricultural Botany on the potatoes sent for immunity trials to the Potato Testing Station, Ormskirk, Lancashire, 1939.
J. Nat. Inst. Agric. Bot. 1944 : **5** : 60–63.

Salaman, R. N.
Report of the Potato Synonym Committee of the National Institute of Agricultural Botany on the trials of new seedling potatoes, carried out at the Midland Agricultural College, Sutton Bonington, in 1941.
Ibid. 1944 : **5** : 64–67.

Salaman, R. N.
Report of the Potato Synonym Committee of the National Institute of Agricultural Botany on the trials of new seedling potatoes, carried out at the Midland Agricultural College, Sutton Bonington, in 1942.
Ibid. 1944 : **5** : 68–69.

The following varietal synonyms have been brought to light: Cherub, from D. and W. Croll, Ltd., Dundee, = Duke of York; Earliest of All, from J. E. Knight and Son, Wolverhampton, = Sharpe's Empress; Dreadnought, from J. E. Knight and Son, Wolverhampton, = Great Scot (1939) and Arran Banner (1941); Lord Allendale, from Wm. Fell and Co. (Hexham), Ltd., = Red King Edward VII; Early Sunrise, from Wm. Edgley, Chatteris, Cambs., = Sharpe's Express; Sharpe's Express and Earliest of All, from J. E. Knight and Son, Wolverhampton, = Arran Pilot; Great Scot, from J. E. Knight and Son, Wolverhampton, = Arran Consul; and Dalhousie, from J. Peed and Son, West Norwood, London, = Up-to-Date.
Varietal trials for resistance to wart disease are also reported.

466. 633.491.00.14(42)
Lord Derby gold medal trials, 1939–42 (inclusive).
J. Nat. Inst. Agric. Bot. 1944 : **5** : 70–80.

The following potato varieties have been tested: Arran Bard, 233/13, Ulster Chieftain, Vanguard, Doon Castle, Doon Well, Doon Eire, 258/23, Craig's Defiance and 711. A Gold Medal has been awarded to Doon Eire. Descriptions of these varieties are appended.

FIBRES 633.5

467. 633.51:575(54)
Twenty-second Annual Report of the Indian Central Cotton Committee for the year ended 31st August 1943 : Pp. 132.

Extensive details relating to cotton breeding in India are presented, among which the following may be mentioned:—
Fuzz grade, although occasionally determined by a single factor, is more often controlled by several genes, intermediate grades breeding true. An association between low fuzz grade and poor ginning percentage is noted. The occurrence of "red leaves", which is associated with early development, appears to be determined by a single gene. Investigations of 5-locular Desi cottons have established the probability that this character is controlled by a single recessive gene. Both the normal 3-locular cottons and the 5-locular strains may give rise to occasional 4-locular variants. The anomalous segregation between normal plants and the single leaf mutants, 7 : 3 instead of 1 : 1, has been confirmed; the inheritance of the single leaf gene is independent of the factors determining petal colour or lint colour. Another gene in the R_2 series, green stem spotless, has been discovered; it is recessive to green stem ghost spot.

The F_5 generation of X-irradiated seeds of M.U.4 exhibits an increase in halo-length and ginning percentage over the untreated material. Dhar No. 43 is being further selected for wilt resistance, while the progeny of Malvi x Jarila are being developed for both quality and wilt resistance. Heterosis has been established in the F_1 progenies of crosses between *Gossypium arboreum* and Bengal strains. An analysis of the components of yield into the four categories of number of bolls per plant, number of seeds per boll, weight of seed cotton per boll, and ginning percentage, has indicated the primary importance of the third component.

Bombay

Segregates 1–2 and 1–6 of the synthetic variety Vijaya have proved highly resistant to wilt and have exhibited a ginning percentage of 41%. They have crossed with Maktampore selections to combine the character of early maturity. The F_5 progeny of Jarila x N.4.5 has proved superior to Jarila in yield, ginning percentage and wilt resistance. Segregates 3 and 7–2 of 8–1 x 1027A.L.F. combine the wilt resistance of the former parent with the valuable agronomic characters of the latter.

Crosses have been made between American cottons and *G. herbaceum* and *G. arboreum*. The hybrids are highly sterile but the back-crosses to the American parents are promising. Amphidiploids have been obtained by colchicine treatment of the hybrid *G. barbadense* x *G. Thurberi*. The tetraploid offspring from crosses between hexaploid American cottons and the diploid *G. armourianum* have exhibited many features of the wild cottons and but few desirable characters. Some improvement has been obtained however by crossing these to Co. 2.

Sind

Sind Sudhar and M4 have been crossed with Express, Wilds, Delfos, Acala, Missdel and Webber and the progenies back-crossed to the Sind-American varieties. The resultant families are being selected for long staple and resistance to red-leaf blight and "tirak".

Punjab

Superior strains are being selected from 289F/43, L.S.S. and Desi cottons. The progenies from 289F/K.25 x 289F/43 and 124F x 4F Sakrand are promising on account of their jassid resistance and good quality. Co.3 and Co.4 have also been crossed with 289F/K.25.

Madras

X-82-1-5, from 7178/1 x 4463, is a promising strain for Coimbatore conditions. A staple length of 24 mm. and ginning out-turn of 33% have been obtained from the progeny of M.3 x P.26–4. Lint colour of Cocanadas cottons is being studied.

Bengal

Seven coarse high ginning strains of Comilla cotton have been developed, strain 9 (1) having a ginning out-turn of 47·1%.

Hyderabad

Strain G.12F–2, an early selection of G.12F, is being selected for high ginning capacity. A derivative of G.16CII–41-6838 is promising on account of its wilt resistance. Raichur strains are also being bred for wilt resistance.

Baroda

Karkhadi material is being bred for resistance to root rot.

Mysore

Doddahathi cottons are being selected for resistance to red leaf disease.

468. 633.51:575.11:575.125
633.51–2.7–1.521.6:575

Progress report of the Cotton Genetics Research Scheme, Indore, 1943–44.

Pp. 27. (Mimeographed).

The genetics of two more lintless mutants, Nandyal lintless (*G. arboreum*) and Viramgam lintless (*G. herbaceum*) have been studied. In the latter a new type of stellate hair with 20–30 short arms has been discovered, which is a simple recessive to the normal stellate hair of 8–10 longer arms. Genetical studies on fuzz grades in *G. hirsutum* show that the simple dominance of tufted over fuzzy seed holds good only when the parents belong to the same variety of cotton. Different varieties of *G. hirsutum* have a different modifier background for the character and crosses among fuzz grades coming from different varieties give a continuous range of types from low tuft to high

fuzz grades in the F_2 generation. It has also been observed that selection for very low fuzz grades in some progenies has led to obtaining sparse linted types; thus a partial association between low fuzz grade and low fibre density is indicated.

A large scale yield trial with bulks from X-ray progenies has confirmed the superiority of them over control in yield, ginning and lint length.

The attempt to evolve a homozygous 5-lock boll type in *G. arboreum* has confirmed the simple recessive nature of this to the normal 3–4 lock condition. The gene responsible, is, however, unstable.

Results would indicate that three petal spots, viz. small, dilute and full, Sr^M, Sr^D and Sr^F respectively, constitute a multiple series. The obtaining of a dihybrid segregation in the F_2 of the cross, dilute spot (Sr^A R_2^{AS}) x full spot (Sr^F R_2^{RS}), for the spot and plant body pigmentation would show that the R_2 and Sr genes assort independently.

Further work on the green spotless mutant reported previously has indicated that it is recessive to ghost spot, but with higher spotted alleles it gives hybrids with high grade pigment of the plant body, almost of the level of the intense red allele.

The character of red leaf, as distinct from Jassid red, appearing in *G. hirsutum* cottons, has been found to be genetic, most varieties bearing the character in a heterozygous condition, but its expression is considerably influenced by environmental factors.

In work upon jassid resistance it has become clear that the amount of leaf crumpling produced by the disease can be used as a criterion of jassid susceptibility. Further progress has been made in the study of wilt and breeding for wilt resistance.

In the study of the potentialities of different ecotypes of *G. hirsutum* with regard to combination of economic characters, the completed analysis of F_1 data has indicated that every character examined shows a clear heterosis. The parents used were the strains K 546, Jarilla, Gao 115, E.B. 31, Sh. 764 and nine Bengal strains. The analysis of the F_2 data was taken up during the year. Examination of F_2 halo length shows that as in the F_1 generation, the F_2 means are consistently higher than the parental averages but the excess over parents is considerably less than in the F_1. The F_2 means are generally in the same order as those of the parents involved. Among all the strains used, F_2 variability is generally less in those crosses where the F_2 means are higher, and this should set a limit to improvement by selection.

Under interspecific hybridization about 22 bolls have been obtained by crossing the doubled hybrid, *G. arboreum* x *G. Thurberi* with *G. hirsutum*. The lint in these bolls is brown and short but silky and strong. It has been found that the *G. Thurberi* crosses do show some resistance to boll worm attack in the early stages, just when the flowers are opening. The other interspecific hybrid *G. hirsutum* x *G. Raimondii* was self-sterile but when doubled became partially self-fertile. The doubled hybrid does not, however, give fertile seeds when crossed with *G. hirsutum*. While *G. Raimondii* is stated to be jassid resistant in Peru, under Indore conditions it is attacked, the characteristic leaf-curl being produced.

469. RAMIAH, K. and NATH, B. 633.51:575.11.061.6 633.51:575"793"

'Red leaf' in *G. hirsutum* cotton.

Proc. 31st Indian Sci. Congr., Delhi 1944 : Pt. III : p. 163. (Abst.).

The red colour in the leaves of *Gossypium hirsutum* may occur uniformly over the whole of the upper surface, in which case it behaves as a Mendelian character; or in patches on both the leaf surfaces associated with a curling or crumpling of the leaf, the latter condition considered to be a result of jassid attack.

It is stated that the former effect may be a desirable character as it causes extra earliness in the plant. B. P. P.

470. 633.51:581.6:519.24(54)

Report on the staple length of the Indian cotton crop of 1943–44 season.

Statist. Leafl. Indian Cent. Cott. Comm. 1944 : No. 1 : Pp. 9.

The aim of this leaflet is the classification, according to length of staple, of the estimated Indian cotton crop of 1943–44.

471. 633.51:581.6:575.12(54.8)

What the scientists are doing. Improvement of Cocanadas cotton.

Indian Fmg 1944 : 5 : 80–81.

A survey of the Cocanadas cotton varieties has been made and a new strain, X20, has been developed. This, although yielding well and having satisfactory spinning qualities, has a lighter lint colour than desirable, and is being crossed with more deeply coloured strains.

472. KARAM RASUL, CH. 633.51:581.6:575.42(54.5)
What's doing in All-India. The Punjab. Cotton improvement.
Indian Fmg 1944 : **5** : p. 84.
Three new strains, 233F, 234F and 238F, have been evolved to replace 289F/43 which they exceed in ginning out-turn. Five strains have also been developed which resemble L.S.S. but mature earlier.

473. 633.51–2–1.521.6:575
Annual report of the Department of Agriculture for the period 1st July 1942 to 30th June 1943.
Uganda, 1944 : Pp. 12.
Work was begun to improve yield, quality and resistance to wilt and *Lygus* of the main Buganda cotton variety B.P. 52, by suitable back-crossing to B. 181.

474. WATERHOUSE, W. L. and WATSON, I. A. 633.52–2.452:576.16:631.521.6(94.4)
Further determinations of specialisation in flax rust caused by *Melampsora lini* (Pers.) Lév.
J. Roy. Soc. N.S.W. 1944 : **77** : 138–44.
Six physiological races (A to F) have been found in Australia. An account is given of their distribution, also details of varietal susceptibility.

475. 633.52–2.483–1.521.6
Seventeenth annual report of the Agricultural Research Institute of Northern Ireland, Hillsborough, Co. Down.
1943–44 : Pp. 35.
Study of the varietal resistance of flax to attack by *Polyspora Lini* and *Colletotrichum Lini* was continued.

476. SEN GUPTA, J. C. and SEN, N. R. 633.523:581.143.26.035.1
On photoperiodic effect on jute plants.
Proc. 31st Indian Sci. Congr., Delhi 1944 : Pt III : 89–90. (Abst.).
Short day treatment for sixty days of two varieties of jute belonging to *Corchorus capsularis* and *C. olitorius* respectively, at two stages, viz. from the time of germination, and from when the plants were 30 days old, resulted in very early initiation of flowers and fruit, compared to the controls. The earliness was associated with reduction in height and thickness of stem and in the number of internodes, and with increase in the number of branches, the treated plants being comparatively more bushy. B. P. P.

SUGAR PLANTS 633.6

477. DUTT, N. L. 633.61(54)
Varietal composition of the sugarcane crop in India in 1941–42.
Indian J. Agric. Sci. 1943 : **13** : 471–77.
The available information regarding the areas under the various sugar cane varieties in the important sugar cane growing provinces and states is summarized. The salient characters of the more important varieties are given. B. P. P.

478. 633.61:575(72.9)
The yield of sugar cane in Barbados in 1940.
Bull. B.W.I. Cent. Sug. Cane Breed. Sta. 1941 : No. 23 : Pp. 12.
Data of acreages and acre yields of the different varieties have been obtained from 241 plantations.

479. 633.61:575(72.9)
Ninth annual report of the British West Indies Central Sugar Cane Breeding Station, ending September 30, 1942.
Barbados 1942 : Pp. 42.
The most outstanding feature is the performance of the seedling B. 37161 in Barbados. A special section is devoted to this from which it is clear that the replacing of the standard varieties by this new seedling will result in a marked increase in the output of sugar per acre. The newer seedling B. 34104 is showing marked promise in Barbados and the contributing Colonies. Of the more recent seedlings B. 38155 and B. 4098 are of particular promise.

480. WILLIAMS, C. H. B. and CAMERON, C. 633.61:575.12(88)
Field experiments with sugar cane, XII.
Sug. Bull. Dep. Agric. Brit. Guiana 1944 : No. 12 : 1–46.

Sugar cane variety trials, including first and second ratoon trials, are reported. Varieties D.14/33, D.14/34, Co.421, D.419/33, D.166/34 and Co.419 have out-yielded P.O.J.2878 and are recommended for planting in British Guiana. D.200/36, from P.O.J.2878 x Co. 213, and B.34104, from Co.281 x B.H.10/12, are also recommended since they yield heavily, ratoon well and are superior to P.O.J.2878 in quality. Other promising lines are D.61/36 (49/30 x Diamond 10), D.201/36 (P.O.J.2878 x Co.213), D.1/37 (P.O.J.2878 x Co.281), D.25/38 (Co.421 x Diamond 10), D.38/38 (P.O.J.2878 x D.145) and D.51/38 (P.O.J. 2878 x Co.213).

481. 633.61:575.127.5(88)
Report on the Sugar Experiment Stations for the year 1943.
Sug. Bull. Dep. Agric. Brit. Guiana 1944 : No. 12 : 65–73.

This report includes details of the results obtained from intervarietal and interspecific sugar cane hybridization, also from intergeneric crosses between *Saccharum* and *Sorghum*.

482. STEVENSON, G. C. 633.61:581.46
Note on a case of twin arrows in a sugarcane seedling.
Rev. Agric. Maurice 1944 : **23** : p. 162.

A description is given of a cane bearing two arrows, which arose from a ratoon stool of a seedling derived from M.134/22 x M.243/40.

483. ARCENEAUX, G. 633.61:581.6
Varietal factors for calculating yield of sugar per ton of cane.
Int. Sug. J. 1944 : **96** : 125–26.

"The difference in calculated yield of sugar per ton of cane between varieties of different millability groups at the same normal juice analysis emphasizes the importance of recognizing varietal differences in making sugar yield comparisons."

484. MCMARTIN, A. 633.61–2.421.9–1.521.6
Pineapple disease of sugarcane cuttings and its control.
Proc. 18th Annu. Congr. S. Afr. Sug. Tech. Ass. 1944 : 44–46.

Ceratostomella paradoxa has been found in cuttings of all commercial varieties. The most susceptible variety is Co. 331. Varieties in which little pineapple disease has been found are Co.290, P.O.J.2725, Uba and P.O.J.2878. At present the disease does not appear to be sufficiently serious to merit the breeding of specifically resistant varieties.

485. 633.61–2.8–1.521.6:575(72.9)
Tenth annual report of the British West Indies Central Sugar Cane Breeding Station, ending September 30, 1943.
Barbados 1943 : Pp. 41.

Nobilization with and importation of further cane species and species of nearly related genera were continued, with the aims of extending variability and selection material. Fundamental investigations on mosaic disease have been begun with a view to establishing routine methods for evaluating degrees of seedling resistance to mosaic and inheritance of resistance.

633.682:576.312.35
486. ABRAHAM, A. 633.682:581.04:576.356.5
Natural and artificial polyploids in tapioca (*Manihot utilissima*).
Proc. 31st Indian Sci. Congr., Delhi 1944 : Pt III : p. 91. (Abst.).

The somatic chromosome number in ten varieties has been found to be $2n = 36$, and in one variety to be $2n = 32$.
Artificial polyploids, showing the usual increase in size and deeper pigmentation of vegetative parts, have been induced in a few varieties by colchicine treatment of the axillary buds.
B. P. P.

487. Pal, B. P. and
Nath, B. V. 633.71:581.165.71:635.64:581.192
The accumulation and movement of nicotine in reciprocal grafts between tobacco and tomato plants.
Proc. Indian Acad. Sci. 1944 : **20** : Sect. B : 79–87.

Reciprocal grafts between *Nicotiana rustica* No. 18 and *Lycopersicon esculentum* var. Pritchard have demonstrated that, when the tobacco is the stock, nicotine is to be found in the scion, and that, in the reverse combination, the quantity of nicotine in the tobacco scion is much reduced. Lateral grafts between the two species lead to a transference of nicotine from the tabacco to the tomato component.

488. Gillett, S. 633.73:575.42
Summary of the annual report on cultural work conducted by the Coffee Services of the Agricultural Department during 1943.
Mon. Bull. Coffee Bd Kenya 1944 : **9** : 108–10.

Work carried out at the Scott Agricultural Laboratories now consists of propagating material from selected trees and recording the yield from the next generation.

489. 633.74–2–1.521.6:575(66.7)
West African Cacao Research Institute, Tafo. Quarterly Report: July to September, 1944 : Pp. 22. (Mimeographed).

Selection, propagation and testing of resistant and tolerant trees to virus disease have been continued. The most outstanding selections are SS.167 and SS.179. The clone S.C.1. developed for resistance to *Sahlbergella* damage has maintained its reputation. S.C.2 is a promising new *Sahlbergella* resistant selection.

490. 633.74–2–1.521.6:575.42(66.7)
West African Cacao Research Institute, Tafo. Quarterly report: October to December, 1944 : Pp. 15. (Mimeographed).

The most promising virus tolerant clones and new selections for capsid resistance are being propagated.

491. 633.74–2.7–1.521.6:575
Greenwood, M. 633.74–2.8–1.521.6:575
Report on the Central Cocoa Research Station, Tafo, 1938–42.
Dep. Agric., Gold Coast 1943 : Pp. 63.

Yield and quality were the main considerations when selection work was begun in 1937. Since 1940, selection has been concentrated on a search for trees resistant to capsids and virus diseases. Material suitable as a basis for a selection programme has consisted of two types, Amelonado and Trinitario. Amelonado breeds true, and is to be distinguished from trees with Amelonado-shaped pods which segregate from the Trinitario hybrid types. It contains a far greater percentage of self-compatible trees than the Cundeamor and Criollo types (Trinitario complex). While it lacks the plumpness and quality of the Criollo types, it has the advantage of uniformity. Selection in the Amelonado type was carried out at the experimental stations over a number of years. The mean yield of 28 finally selected trees ranged from 7·0 to 15·2 lb. dry cocoa per annum. No yield records were available from the Trinitarios until 1938, since when yearly records have been taken from trees at the experimental stations and from scattered farms. The average yield of 15 continuously recorded selections does not compare favourably with that of the Amelonado selections. The comparison is rendered difficult by the unknown age factor and dissimilar recording periods.

Experiment has suggested that the preference shown in the field by *Sahlbergella theobromae* for the shoots of seedlings and trees under six years old was not influenced by sap palatability.

A field experiment has been established to compare the resistance of budded plants of an S.C. 1 selection with the susceptibility of the Amelonado type. Degrees of resistance have been observed between clones. Promising signs of tolerance to swollen-shoot have also been noted between clones; the selection No. SS. 167 is worth particular mention; in the testing of hybrid types, AH 22 and the parent K5 appear to be the most promising selections.

Preliminary work has been carried out on the induction of polyploidy by treatment of seedlings with colchicine. There are morphological indications that polyploidy has been induced by 25 [*sic*] per cent. solution.

Transmission by grafting under similar environmental conditions has established that there are several strains of swollen-shoot virus, infecting cocoa. The range of symptoms follows a close parallel with the peach virus complex in the U.S.A. The Bisa type is a mild strain, capable of conferring some degree of immunity against the prevalent virulent (New Juaben) strain. The Kpeve type, however, does not confer immunity and is probably a distinct virus, to be known as "Mottle Leaf". Other strains are under investigation.

492. NOTT, J. 633.79–1.547.6(42.47)
Report on new (Wye) varieties of hops—season 1944.
Worcs. Agric. Quart. Chron. 1944 : **12** : 259–63.
Brief notes are given on the condition of the hops of thirteen varieties at the time of picking.

493. SALMON, E. S. 633.79.00.14(42)
Twenty-seventh report on the trial of new varieties of hops, 1943.
J. Inst. Brew. 1944 : **50** : 270–79.
Details are given of the yields and contents of α and β resins of recently developed hop varieties.

CONDIMENTS 633.84

494. CHOWDHURY, S. 633.841(54.1)
Cultivation of *pan* in Sylhet.
Indian Fmg 1944 : **5** : 122–24.
This article includes a short description of the three main Sylhet varieties, Parua, Puathi and Sanchi (or Chandana) of *Piper Betle* L.

OIL PLANTS 633.85

495. HENRY, A. J. and GRINDLEY, D. N. 633.85:581.6
Investigation of the oil of the seeds of *Cephalocroton cordofanus*.
J. Soc. Chem. Ind., Lond. 1943 : **62** : p. 60.
The oil from seeds of *Cephalocroton cordofanus*, apparently not previously described, is intermediate in composition between castor oil and olive oil, and contains a significantly high proportion of ricinoleic acid or an isomeride thereof.

496. ABRAHAM, A. 633.853.74:576.312.35:575.127.2
Cytological studies in *Sesamum*.
Proc. 31st Indian Sci. Congr., Delhi 1944 : Pt III : p. 91. (Abst.).
A wild *Sesamum* from Travancore, provisionally named as *S. orientale* var. *grandiflorum*, is reported to have $2n = 26$ chromosomes. It has been crossed with *S. orientale* (local) and *S. prostratum*. B. P. P.

497. SALLANS, H. R. 633.854.54:581.6
Canadian linseed. I. The effect of variety and environment on the composition of linseed.
Canad. J. Res. 1944 : **22** : Sect. F : 119–31.

SALLANS, H. R. and SINCLAIR, G. D.
Canadian linseed. II. Relations between iodine value and fatty acid composition of linseed oil.
Ibid. 1944 : **22** : Sect. F : 132–45.
Significant varietal differences in oil content, iodine value, 1000-kernel weight, refractive index of oil, thiocyanogen value and saturated content have been established between the varieties Bison, Royal and Redwing. Environmental factors also exert an important effect. Correlation coefficients between these various characters are derived and their significance discussed.

498. SABNIS, T. S. and MEHTA, T. R. 633.854.54–2.452–1.521.6:581.6:575.12
Improvement of linseed in the United Provinces.
Indian Fmg 1944 : **5** : 224–26.
A number of crosses between Indian linseeds and imported flax types were effected in 1924–25. The flax types were resistant to rust, but very late in maturity; they were tall and gave lower seed yields, the seeds being medium in size and of lower oil content when compared to the

indigenous parents, which, while possessing desirable characteristics of early maturity, satisfactory yielding capacity, "bold" seed size and high oil content, lacked resistance to rust. They were also short and unsuitable for fibre production. Four selected strains, C1150, C1193, C1196 and C1206, all "bold"-seeded and productive types, have been under field-scale trials and multiplication since 1933–34, the first three being brown-seeded and the last light yellow-seeded. The cultivation of C1150 and C1193 is being extended in Mirzapur district and in Bundelkhand; the former is the product of the cross Atarra (local) x Levant, and the latter of Jaitipur (local) x English. These four types are as early as the local linseeds. Their resistance to rust has been strikingly shown in 1933–34 at the Research Farm, Cawnpore. The types C1150 and C1193 have yielded on an average 10–15 % higher produce of seed when compared with the local linseeds on cultivators' fields.

One of the variants of C1193, viz. C1193–1, has been specially selected. This variant is uniformly taller than the original C1193; the main stems also begin to branch much higher up (a characteristic of the flax parents) as compared with local varieties. Much taller hybrids than C1193–1 are available, but they are not as early. For the present only C1193–1 has been taken up for multiplication. With its satisfactory seed yield and straw length, and earliness, it would be a good substitute for flax which offers difficulty not only on account of its later maturity, but also on account of its low value as an oil yielding crop.

499. Webster, C. C. and
Selby, M. F. H. 633.854.56:575.42(58.9)
A progress report on the selection and vegetative propagation of promising tung trees (*Aleurites Montana*).
Nyasald Agric. Quart. J. 1944 : **4** : No. 4 : 1–6.

Work in progress at the Tung Experimental Station aims at the production of improved planting material by selection and vegetative propagation of high yielding trees. It is emphasized that it will be some years before the production of a number of selections of really high quality is possible. Especially is this so because it is essential to base final selections upon performance of buddings rather than on yields of the mother trees themselves.

500. Unrau, J. and
White, W. J. 633.854.78:575.125:581.162.5
The yield and other characters of inbred lines and single crosses of sunflowers.
Sci. Agric. 1944 : **24** : 516–25.

Inbred sunflower lines are characterized by a decrease in vegetative vigour. The F_1 plants of single crosses from these lines, however, may be very vigorous and in one case, a yield increase of 60·80 % over the original unselected Mennonite material was obtained. Differences in self-fertility and pollen productivity are important if the hybrids are to be obtained by natural crossing.

501. 633.855.34:575.12
633.855.34:581.331.2
Fifth annual report of the Oil Palm Research Station, Nigeria, 1943–44.
1944 : Pp. 31. (Mimeographed).

Promising offspring have been obtained from crossing thick-shelled palms with var. *pisifera*. Studies on pollen viability have demonstrated the great variability of this character; 16% maltose is recommended as a medium for pollen germination.

MEDICINAL PLANTS 633.88

502. Mehra, P. N. 633.88:576.312.35
Chromosome number and morphology in some species of the genus *Ephedra*.
Proc. 31st Indian Sci. Congr., Delhi 1944 : Pt III : p. 92. (Abst.).

It is stated that the chromosome number and morphology in seven species of the genus have been worked out, and that the basic chromosome number appears to be $x = 7$. B. P. P.

503. MEHRA, P. N. 633.88:581.04:576.356
Colchicine and sulphanilamide effect on the mitotic division of body nucleus in the pollen grains in the genus *Ephedra*.
Proc. 31st Indian Sci. Congr., Delhi 1944 : Pt III : p. 93. (Abst.)
The effect of sulphanilamide was found to be similar to that of colchicine in bringing about the collapse or inhibition of the spindle mechanism. B. P. P.

RUBBER PLANTS 633.91

504. SYMONTOWNE, R. 633.913:575
Notes on the *Cryptostegia* plant.
Trop. Agriculture Trin. 1943 : **20** : 195–97.
The history and cultivation of *C. grandiflora*, a plant of high rubber content belonging to Asclepiadaceae are described and the problem of commercial extraction of latex in the field is discussed. The possibility of combining the high rubber content of *C. grandiflora* and the high latex flow per unit of cross-sectioned area of *C. madagescariensis* in clones is being explored. Almost 100% success is obtained from every form of budding and grafting in *Cryptostegia*. Research has further indicated that the plant produces genetically pure lines very readily. The technique of coagulation and sheeting practised at Gonaives, Haiti, is described.

FRUITS 634

505. 634.11:575(42)
Royal Horticultural Society Report. Fruit and Vegetable Committee.
Gdnrs' Chron. 1944 : **116** : p. 196.
Mention is made of a new variety of apple, Sunset, whose fruit has the appearance of good grade of Cox's Orange Pippin. It is said to be very prolific, and is on trial at Wisley.

506. TYDEMAN, H. M. 634.11:575(42.23)
A preliminary account of experiments in breeding early and mid-season dessert apples.
Ann. Rep. E. Malling Res. Sta. 1943 (1944) : **51** : 34–42.
Progress in the work of producing a series of varieties similar in appearance to Worcester Pearmain but with varying seasons of fruit maturity is described. Details are given of the inheritance of a number of characters of the tree, flowers, foliage and fruit. Nineteen seedlings have been selected, likely to be valuable as new dessert apples. Of these selections the three most promising were all derived from the cross McIntosh Red x Worcester Pearmain. These three seedlings, Nos. **431**, **432** and **435**, are described in detail.

507. KIDSON, E. B. 634.11:577.16(93.1)
The vitamin C content of Nelson apples.
N.Z. J. Sci. Tech. 1943 : **25** : Sect. B : 134–36.
Varietal analyses of the vitamin C content of New Zealand apples are reported.

508. FITZPATRICK, R. E.,
MELLOR, F. C. and
WELSH, M. F. 634.11–2.411.4–1.521.6(71.1)
Crown rot of apple trees in British Columbia—rootstock and scion resistance trials.
Sci. Agric. 1944 : **24** : 533–41.
The susceptibility to *Phytophthora Cactorum* of 40 different apple varieties and seedlings has been investigated by artificial inoculations of 1560 trees.

509. HOCKEY, J. E. and
EIDT, C. C. 634.11–2.421.9–1.521.6:575.12
Resistance of apple seedlings to scab.
Sci. Agric. 1944 : **24** : 542–50.
The progeny of over 100 apple crosses has been investigated for resistance to *Venturia inaequalis*. In general, susceptibility appears to be dominant, the more promising resistant parents including Red Winter Reinette, Cox's Orange Pippin, Golden Russet and Yellow Transparent. *Pyrus Niedwetzkyana* affords the nearest approach to immunity. The apparent resistance of seedlings derived from triploid parents is believed to be due to delayed foliation rather than true resistance.

510. CRANE, M. B. 634.11–2.8–1.521.6:581.165.71
Origin of viruses.
Nature, Lond. 1945 : **155** : 115–16.
The apple variety Lord Lambourne develops a non-rigid growth habit when grafted on to Excelsior, and forms abnormally small fruits when grafted on to Redcoat Grieve. It is suggested that these conditions arise by the invasion of the scion by the proteins of the stocks, a behaviour characteristic of virus infection.

511. LEVITT, E. C. 634.31:575.247
The need for care in selection of Late Valencia buds. Avoid strains which tend to sport.
Agric. Gaz. N.S.W. 1944 : **55** : 382–83.
The history of the orange variety Late Valencia is described and a warning is issued against the tendency of some strains to produce "sport limbs" which give rise to worthless fruits.

512. KUMAR, L. S. S. and ABRAHAM, A. 634.651:576.3:575.11
The papaya, its botany, culture and uses.
J. Bombay Nat. Hist. Soc. 1943: **44** : 252–56.
This publication contains a description of the economic uses of *Carica Papaya*, and touches upon its cytology and genetics of sex.

513. BERKELEY, G. H. and CHAMBERLAIN, G. C. 634.711–2–1.521.6
Diseases of the raspberry.
Fmrs' Bull. No. 123 Dep. Agric. Can. 1944 : Publ. No. 760 : Pp. 11.
This bulletin includes brief references to varietal susceptibility of raspberries to various diseases.

FORESTRY 634.9

514. BLACK, R. A. 634.973:575.127.2:582
Description of new eucalypt hybrid x *Eucalyptus radiodives* ("Buttercup Peppermint") (*radiata* x *dives*) R.A. Black, hybrid nov.
Victorian Nat. 1944 : **60** : p. 175.
A botanical description is given of a tree believed to be a hybrid of *E. radiata* x *E. dives*.

VEGETABLES 635

515. RITCHIE, T. F. 635:575(71)
Horticultural dividends—from vegetable plant breeding.
Canad. Hort. Home Mag., Gr. Ed., 1943 : **66** : 203–04.
A brief review of the contributions made by plant breeders to Canadian horticulture is presented. Among the crops mentioned are sweet corn, tomatoes, cucumbers, beans, soya beans, peas, the egg-plant and rhubarb.

516. HAWKINS, F. 635:581.331.3(67.6)
Pollen control in vegetable crops.
E. Afr. Agric. J. 1944 : **10** : 90–91.
This article recommends the study of the data relating to spatial isolation observed in Great Britain, and investigations upon similar lines in East Africa.

517. STUBBS, L. L. and GRIEVE, B. J. 635.13–2.8–1.521.6(94)
A new virus disease of carrots.
J. Dep. Agric. Vict. 1944 : **42** : 411–12, 415.
A new virus disease of carrots, transmitted by aphids, is described. The variety West Australian (=Osborne Park, Champion Long Red, and Champion Intermediate) and a Victorian grower's selection are tolerant of the virus; the other varieties tested were susceptible.

518. THOMPSON, E. G. 635.36.00.14(42.59)
Brussels sprouts trials, 1940–42.
J. Nat. Inst. Agric. Bot. 1944 : **5** : 45–59.
Details are given of Brussels sprouts varietal trials carried out in Cambridge in 1940–42.

519. TAYLOR, H. V. and SKILLMAN, E. E. 635.48(42)
Rhubarb.
Bull. Minist. Agric., Lond. 1944 : No. 113 : Pp. 24.
This bulletin includes a brief description of the history and characteristics of English rhubarb varieties.

520. WALKER, W. F. and PIERCE, K. W. 635.64:575.42(94.6)
Tomato production investigations, 1943–44.
Tasm. J. Agric. 1944 : **15** : 71–82.
Extensive trials have been made with the object of selecting varieties most suitable for canning requirements and which are adaptable to the climatic and varied soil conditions of the State. Results indicate that both fruit yield and quality have been improved by re-selection. The value of fruit selection for seed saving has also been demonstrated.

521. KIDSON, E. B. 635.64:577.16(93.1)
Vitamin C content of different tomato varieties grown in the Nelson district.
N.Z. J. Sci. Tech. 1943 : **25** : Sect. B. : 129–34.
The differences in the ascorbic acid content of New Zealand tomatoes due to genetical constitution and external factors are indicated.

522. SAGAR ROY, R. 635.646:575
A new variety of brinjal (*Solanam melongenum* L.).
Curr. Sci. 1944 : **13** : 287–88.
A promising variety with the same violet colour as S.T.1. but of higher yield has been designated S.T.2.

523. WAGER, V. A. 635.646–2.3–1.521.6
Bacterial wilt of the egg-plant.
Fmg S. Afr. 1944 : **19** : 661–64.
The Javanese varieties Terong Kopek [Long Violet] and Terong Gowok [Small Mauve] are highly resistant to bacterial wilt; the Ceylonese variety is moderately resistant.

524. WHITE, N. H. and RAPHAEL, T. D. 635.656–2.411.4–1.521.6 635.656–2.8–1.521.6
The reaction of green pea varieties to downy mildew and two viruses.
Tasm. J. Agric. 1944:**15** : 92–93, 97, 104.
The observed reactions of the different varieties to *Peronspora Pisi*, *Pisum* virus 2 and a virus disease resembling enation virus can be sorted into a number of classes ranging from those affected by all these diseases to those in which no disease was observed. From observations made on the enation virus and downy mildew, effects on yield might be considerable under certain conditions, and it is proposed to follow up these observations with further experimental work.

Part II. Foreign.

*STATISTICS 519

525. Simpson, G. G. and Roe, A. 519.24
A standard frequency distribution method.
Amer. Mus. Novitates 1942 : No. 1190 : 1–19.

A standard procedure for reducing experimental data to a form amenable to the statistical techniques used for treating frequency distributions is described.

526. 519.24:631.421
De Fina, A. L. 633.854.54.00.14(82)
Método gráfico e índice numérico para conocer la seguridad de eficiencia de las variedades agrícolas. (**A graphical and numerical index for determining the degree of efficiency of agricultural varieties**).
Rev. Fac. Agron. La Plata 1943 : **25** : 21–54.

Arguments are given in favour of using varieties possessed of a high degree of efficiency, i.e. varieties which in all years and under almost all conditions will give a yield comparing favourably with the best varieties, rather than varieties that may under optimum conditions give outstanding yields but otherwise prove very unsatisfactory. The linseed variety Querandí M.A. is cited as a variety of high efficiency.

A graphical method of determining the efficiency and expressing it as an index is presented. This latter is calculated as follows:—

$$\text{Efficiency Index} = \frac{(E_1 1^3) + (E_2 2^3) \ldots (E_n n^3)}{1^3 + 2^3 \ldots n^3}$$

where E = the average yield of the variety expressed as a percentage of the average yield of the best variety for the trial in question, and 1, 2 and 3 etc., indicate the positions as regards efficiency of the variety in descending order in the different trials.

The same method can be applied to other characters besides yield.

BIOLOGICAL SCIENCES 57

527. Copeland, H. F. 57:001.4
Biological terminology.
Science 1944 : **100** : 265–66.

A short discussion of the divergent meanings attached to the term "cell", "respiration" and "mitosis" is presented.

*BREEDING 575

528. 575:632–1.521.6
Much delay in search for better plants.
N.S. Dak. Hort. 1944 : **17** : p. 157.

The difficulties attending plant breeding, in particular breeding for disease resistance, are briefly indicated.

529. Lasser, E. 575:633(43.6)
Das Sortenproblem im alpinen Pflanzenbau. (**The variety problem in plant cultivation in Alpine districts**).
Kühn-Archiv 1943/44 : **60** : 358–68.

The problem of varietal adaptation in Alpine regions arises particularly in connexion with herbage plants and cereals, including maize.

The main concern as regards cereals intended for cultivation in such districts is that they should be reliable in yield, and to ensure this rye, wheat and oat varieties must be resistant to black rust. The Admont Institute for Plant Cultivation (Pflanzenbauinstitut Admont) is to study the problems of (1) which varieties of black rust do most damage and to which cereals, and (2) whether the enormous masses of spores producing rust epidemics come from within the country or from the southern neighbouring states.

The particular requirements as regards the individual cereals and how far these desiderata are met by existing varieties are enumerated. Land varieties should, it seems, provide a considerable part of the initial material for the breeding operations.

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* General studies, see also individual crops.

530. 575:633(48.5)

I växtförädlingens tjänst. Från Utsädesföreningens årsmöte i Svalöv. (**In the service of plant breeding. From the Seed Associations Annual Meeting in Svalöf**).

Lantmannen 1944 : **28** : 713–14.

The material in the experimental plots demonstrated at this meeting forms part of that discussed in the 1943 annual report of the Association (cf. Abst. 531).

531. *Åkerman, Å. 575:633(48.5)

Årsberättelse över Sveriges Utsädesförenings verksamhet under år 1943. (**Annual report on the work of the Swedish Seed Association during 1943**).

Sverig. Utsädesfören. Tidskr. 1944 : **54** : 115–72.

New varieties and élites handed over to the Allmänna Svenska Utsädesaktiebolaget, and the Svenska Sockerfabrieksatiebolaget [Swedish Sugar Factories Company] during 1943 included: the winter-hardy and high-yielding wheats 01281 and 01282 from K 01280 (Sol III x Standard) and the new winter hardy wheat 01420a, from Skandia II x Sv 36/175, derived from a Västergötland land wheat, and intended as a competitor for Ergo and Borg; the 2-rowed barley 40/13 which gave 5% more grain than Freja and Balder; an early yellow seeded fodder pea 01080 (from Torsdags x Solo), 6–7 days earlier than Solo and especially valuable for fodder in southern and central Sweden; the early fodder peas 05321 and 05322 intended for Norrland; the round, easily lifted fodder beet Rödkägla (Red Cone), obtained from Röd Obendorfer x sugar beet, and having a high dry matter content; the turnips J 012 (from Östersundom x Mainaepe) and J 014 (from Bortfelder x Mainaepe); and the club-root resistant variety Vg. 024 (from Östersundom x Mainaepe).

The 1940–42 selections of winter rape and turnip rape strains handed over to the Seed Company represent a great advance in winter hardiness.

A report is given on comparative trials and breeding operations at Svalöf on spring and autumn cereals, legumes (including sweet lupin), herbage plants, potatoes, root crops, textile plants, oil plants (including soya bean, poppies and sunflowers), maize, tobacco, hops and rubber bearing plants.

Cytological research included the study of polyploids comprising 7 series of tetraploid flax, 174 F_4 families from crosses between tetraploid varieties, about 200 X_3 families and an experiment on 3 tetraploid varieties of which the second and fifth generations after chromosome reduplication were compared.

Work was also done on polyploid clovers and comparative trials of hexaploid and octoploid timothy were laid down.

Tetraploid sugar and fodder beets were included in a bolting experiment.

Further research included an X_3 analysis of three chlorophyll mutants induced in diploid flax by X-ray irradiation; a study of the occurrence of spontaneous chromosome doubling in sugar beets and investigations on the cytological effects of different chemical substances; chromosome determinations of over 5000 sugar beets, and a detailed study of the camphor reaction in yeast, which suggested that this reaction may be regarded as a narcosis of the normal growth control in yeast cells.

In conclusion, reports are appended giving details of the variety trials and other work of the branch stations and of the Swedish Seed Association Legume Division.

532. 575:633(67.5)

Rapport pour les exercices 1940 et 1941. (**Report of 1940–1941**).

Inst. Agron. Congo Belge 1943 : Pp. 152.

Of interest to plant-breeders are the experiments in progress in different departments of the various stations.

Pyrethrum

Selection is in progress.

Wheat

Wheat is grown and selected at the experiment station of Kisosi.

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* An extended abstract of this report is on file at the Bureau.

Maize
Selection is for high yield and the production of a grain of the Yellow Plata type about 8–9 mm. long. The results of selection at Gandajika are recorded. At Kisosi the improvement of the red variety has been abandoned in favour of the white variety.

Rice
Selection is for yield and the production of a long grained rice. New varieties have been introduced and types selected for use as mother plants for crossing. Comparative tests have been made.

Potatoes
Comparative tests have been made on Russian and Peruvian varieties and four varieties introduced from Rubona.

Sweet potatoes
Comparative tests have been made confirming the good results of Algerian varieties and of Yellow Jersey. Special attention is paid to resistance to virus and to insects. Local and introduced varieties are under observation at Kisosi.

Cotton
A study of the resistance of various lines of cotton to stigmatomycosis at Bambesa showed some resistant trees but the progeny of 145–C–53 still gave, in practice, the greatest yield of second grade cotton. A wilt-resistant plant A6, supposedly from 270, was discovered in 1940 and the recent reports on the progeny are promising. At Gandajika, experiments on the resistance of lines of cotton to *Dysdercus*. The F_2 were least subject to attack, possibly owing to their rough capsules. The Triumph types were more resistant than the U4 types. The results of experiments at Bambesa in selection, hybridization and multiplication are recorded and of selection at Gandajika.

Cassava
Selection is made for high yield per hectare and a high content of flour and starch.

Coffee
At Mulungu experiments are in progress on resistance to *Colletotrichum*. Local Bronze is most resistant, and Mysore most susceptible. Observations on mother trees and their progeny are recorded.

Cacao
Observations on mother trees of Forastero and of Criollo x Forastero are noted. Selected material from Yangambi is being planted at Kindo.

Cinchona
Results of varietial tests are given. Selection is in progress.

Oil palm
Work on selection continues. At Kondo observations are made on the descendants of selected material from Yangambi.

Rubber
New and known clones are being examined and selected.

Citrus fruits
The observations on introduced varieties are continued.

Peanuts
Selection is being made for high yield, richness in oil and uniformity. Pedigree selection, hybridization and multiplication is in progress at Gandajika.

Bananas
Selection is for highly productive clones with good quality fruits and a high yield of flour. The decreasing yield of the crop at Vuazi is being investigated.

Haricot beans
Comparative tests of varieties are in progress as well as line and mass selection at Nioka. At Kisosi the results of comparative tests have been recorded.

Soya bean
Varietal tests are recorded.

R. M. I.

533. McCall, M. A. 575:633(73)
Crop improvement, a weapon of war and an instrument of peace.
J. Amer. Soc. Agron. 1944 : **36** : 717–25.

A review is given of the contributions made by plant breeders toward the production of hybrid maize, disease resistant oats, soya beans, rust resistant wheat and cotton.

534. Corbett, R. B. 575:633(75.2)
Science serves in war.
56th Ann. Rep. Md Agric. Exp. Sta. 1942–1943 (1944) : Pp. 47.

Sweet maize
A number of new yellow hybrids show yield promise without appreciable sacrifice in quality. Crosses including the inbred line H–84 show marked yield increases among white corns.

Barley
Wong is a beardless, stiff-strawed, small-seeded new variety with a high degree of winter-hardiness under some conditions.

Strawberry
A new red stele resistant variety, named Temple, is a mid-season commercial berry of high quality.

535. Dorman, C. 575:633(76.2)
Highlights of the work of the Mississippi Experiment Station.
54th Ann. Rep. Miss. Agric. Exp. Sta. 1941 : Pp. 59.

Tung
Selections have been made from trees having desirable growth characteristics and producing large and regular yields of nuts high in oil content.

Cucumber
Selections satisfactory to packers from the standpoint of good fruit colour have been grown. Data have been obtained on nematode attacks.

Tomato
Selections from crosses between Summerset as common parent and Gulf State Market, Louisiana Pink, Marglobe and Rutgers have shown marked capacity for setting seed under adverse conditions. A number of progenies involving "red currant" and several commercial varieties have proved to be highly resistant to wilt.

Beans
Numerous lines have been obtained which contain plants showing high resistance to mosaic.

536. Taggart, W. G. 575:633(76.3)
Agricultural research in Louisiana 1941–1942.
Rep. La Agric. Exp. Sta. 1942 : Pp. 145.

This report includes the following items relating to plant breeding:—

Oats
The recently introduced variety Louisiana 629 is highly resistant to rust and has short awns.

Rice
Blue Rose 41, selection from Blue Rose, is resistant to the common race of *Cercospora Oryzae*; B2913A29–1–1–1, a selection from Colusa x Blue Rose, is an early strain resistant to *Cercospora* leaf spot; C283A9–6–1, from Edith x Fortuna, is an early non-shattering line; while C321A4–11–2, from Rexovo x Delitus, combines the nutty flavour of Delitus with resistance to *Cercospora* leaf spot.

Dallis grass
Local strains have been selected. Varietal differences in susceptibility to ergot are reported.

Sweet potato
Seedling 1x6–39–10 is superior to Porto Rico in its content of vitamins A and C.

Cotton
Hopi has been crossed to Upland strains in order to incorporate in the latter the quality of fine fibre. D. and P.L. 829 x Dixie Triumph 55–62–75 has been selected from wilt resistance and fibre quality.

Sugar cane
C.P. 33–243 is a recently released mid-season variety with a medium sucrose content but susceptible to red rot. C.P. 34–120 is a tall vigorous variety which yields well and has possibilities as a windrowing form.

Strawberry
The new variety Konvoy has out-yielded other Louisiana forms.

Cabbage
Two new varieties, Louisiana Copenhagen and Louisiana Allyear, are described (cf. Abst. 768).

Onion
Strain C–5 of Creole is recommended on account of its uniform shape and colour and resistance to premature seeding. Louisiana Evergreen is a new shallot, selected from Louisana Strain I white shallot x *Allium fistulosum*; it is resistant to pink root and remains green throughout the year.

Okra
Louisiana White Velvet is a recently developed variety with white, spineless, velvet-type pods. Louisiana Green Velvet is similar but has green pods.

Soya bean
The new variety Pelican produces a high forage yield and is resistant to shattering and autumnal rain damage.

537. 575:633(77.7)

Report on agricultural research for year ending June 30, 1943.
Rep. Ia Agric. Exp. Sta. 1943 : Pt I : Pp. 298.

Wheat
In the development of superior disease-resistant varieties, resistant varieties used in crosses were Mercury and No. 2807 from North Dakota and a Russian species *Triticum Timopheevi*. All three are highly resistant to stem rust; *T. Timopheevi* is also resistant to leaf rust, bunt and mildew. The hard red winter varieties used as parent material were Iowin No. 2488 and a selection from Hard Federation x Kawvale. Crosses from the hard red varieties have given 621 selections, now in the F_3 generation, and those with *T. Timopheevi* 23, now in the F_1 generation.

Oats
Many of the selections included in the yield tests were superior to the check varieties in yield, test weight, stiffness of straw and resistance to crown rust and halo blight. Most of these superior new selections were Bond hybrid selections. Several selections appear to have as large a margin of superiority over Tama, Boone and Marion in bad crown rust years as these new varieties have over the older susceptible varieties.
Interspecific crosses, such as *Avena sativa* x *A. byzantina*, appear to exhibit greater heterosis than intraspecific crosses.

Maize
In the study of the mechanism of virulence, mutations have been sought in bacterial wilt of maize, *Phytomonas Stewartii*. The virulence of morphological mutations is often different from that of the parent strain, and particular morphological types do not give the same virulence reactions A certain consistency has been observed in the mutant pattern towards virulence.
It is supposed that genes are the inherited basis for virulence and that virulence depends on more than the genes of a single allelic series.

Kentucky Bluegrass
Nearly 300 selections have been obtained, and will be studied for sod forming ability, leafiness, resistance to disease and ability to recover after cutting.

Brome grass
Inbreeding of a large number of S_1 lines gave additional information on the effect of inbreeding on self-incompatibility. Data on forage yields indicate that one generation of inbreeding resulted in 33% loss of vigour. In general, high yielding multiple cross progenies came from high yielding mother strains.

Lucerne
A synthetic variety, composed of strains developed in Nebraska from the Cossack, Turkestan and Ladak varieties, tested under the number A–136, has been named Ranger. Yield trials during

the first two crop years have so far indicated that Ranger does not produce as much forage as Ladak, has produced slightly less than Dakota Common and Grimm, and slightly more than Hardistan. It has not yet been tested long enough to know how wilt resistant it is under Iowa conditions.

Sweet clover

F_2 plants were studied from the cross of Pioneer, a low coumarin, early-flowering selection from Saskatchewan, and Fowlds White, a late-flowering, disease resistant strain from South Dakota. Coumarin analysis indicated that this character is inherited according to a 9 : 7 ratio. The frequency distribution in the F_2 population in respect of *Ascocyta* [*sic*] disease index, flowering date, and seed production suggests multiple factor interaction for these characters. Highly significant correlations were obtained between date of flowering and *Ascocyta* infection, the earliest plants having the highest disease score.

Results to date would lead to the conclusion that genetic factors conditioning levels of self-fertility and cross-fertility in colchicine-induced tetraploids are operative in the tetraploid stock even though these genetic factors are absent in normal diploid plants. Cytological investigations of these plants are in progress.

Crosses were made in 1941 between annual and biennial varieties of *Melilotus alba* and *M. suaveolens*, primarily to study inheritance of annual versus biennial growth in intraspecific and interspecific hybrids and of flower and seed coat colour in the inter-specific cross. Data for self-sterility among back-crossed F_1 plants suggest that these two species have become sufficiently differentiated in respect of chromosome homology that pairing in meiosis is not normal. Factors responsible for abortive pollen also prevent normal development of egg cells. Segregation of flower colour in the cross of annual *M. alba* x annual *M. suaveolens* fits a 3 : 1 ratio in the F_2 and a 1 : 1 ratio in the back-cross.

Potato

Comments are made upon the performance of the recently introduced varieties Sebago, Sequoia, Norkota, Pawnee, Seedling No. 46952, Seedling No. 528–194, Seedling No. 528–118 and Seedling No. 528–229.

Flax

Two recently introduced varieties, Redson and Koto, show sufficiently high quality to replace Bison.

Apple

Selections, which included crosses involving Delicious, McIntosh and Jonathan, have shown increased hardiness.

Pear

Crosses and selections from some of the hardiest types have come through two distinct test winters without injury.

Plum

Diploid species inter-cross readily, e.g. *P. americana*, *P. salicina*, *P. Besseyi* and *P. Simonii*. Crosses of diploid varieties with tetraploid (European) have largely failed. Crosses of (*P. americana* x *P. salicina*) x peach have produced sterile hybrids.

Raspberry

Selections have been obtained with increased resistance to both anthracnose and cold.

Melon

Two promising new lines have been obtained, showing marked resistance to anthracnose, food quality and earliness. The study of a technique of producing hybrid seed was continued.

Pumpkin

Several selected inbred lines have been secured showing uniformity of fruit size, shape, and colour of skin and flesh, and are ready for canning tests.

Tomato

A comparison of growth and its rate in the $n - 2n - 4n$ series of the common tomato was completed. The slightly reduced axillary sprouting of the tetraploid and its higher moisture content very likely account for the somewhat unexpected lack of any superiority of the phenotypically sturdy tetraploid over the diploid.

Soya bean
The variety Lincoln, formerly designated as L6–685, has exceeded the average yield of Dunfield and Illini by 6·2 bushels for a 5-year period, and also has better seed quality. It has exceeded Dunfield, until now considered the highest oil producing variety in commercial production, in percentage protein, percentage oil and iodine number of the oil. It has averaged one day earlier than Illini.

538. JOHNSON, I. B. 575:633(78.3)
Agricultural research in South Dakota.
56th Ann. Rep. S. Dak. Agric. Exp. Sta. **1943** : Pp. 58.

Apple
Many crosses have been made for the production of triploid apples.
Tomato
A tomato-breeding programme is in progress to produce an early, drought resistant, high-quality tomato.

Sweet Maize
The main object was to develop a hybrid sweet maize tolerant to high temperatures. Some hybrids from inbred lines are being observed for the second and a few for the third season.

539. HENNEY, H. J. 575:633(78.8)
Fifty-fifth Annual Report of the Colorado Agricultural Experiment Station 1941–42 (1942) : Pp. 58.

Barley
It is stated that two newly discovered genes have been located on the chromosomes. One of these was produced after X-irradiation.

Potatoes
Strains are being tested for psyllid resistance. A new variety, Pawnee, has been released.

Onions
Breeding for resistance to storage rot, purple blotch and thrips is reported.

540. HENNEY, H. J. 575:633(78.8)
Fifty-sixth Annual Report of the Colorado Agricultural Experiment Station 1942–43 (1943) : Pp. 39.

Oats
The variety Bannock, from Victoria x Markton, yields well in Colorado and is resistant to smut.

Barley
It is stated that two newly discovered genes have been located on chromosome I. Strains are being tested for resistance to loose smut.

Lucerne
Seed productivity is subject to genetical control.

Potatoes
Seven lines resistant to psyllids are being developed.

Onions
Breeding for resistance to thrips and purple blotch continues.

541. FUCHS, W. H. 575:633:578.08
Physiologische Methoden in der Pflanzenzüchtung. (**Physiological methods in plant breeding**).
Kühn-Archiv **1943/44** : **60** : 288–314.
Some comments on methods of selecting for quality are followed by an elaborate discussion of methods of selection for factors determining reliability of yield. This second aspect of the subject is grouped under the following heads: ecological trials in the open; laboratory methods, their technique and when they should be used; and finally the relative advantages and disadvantages of ecological trials and laboratory tests.
The concluding portion of the argument is illustrated by references to work by various workers on frost resistance and the tendency to germination in the ear.
Relevant literature is freely cited.

542. TUKEY, H. B. 575:633:581.481:578.08
Plant breeding by incubator methods.
Sci. Mon., N.Y. 1944 : **58** : 321–22.
[From Biol. Abstr. 1944 : **18** : Sect. A : 15389].
"In certain cases when attempts to produce hybrid plants have failed through failure to produce viable seed, success has been attained by excision of young embryos and culture in a proper medium (containing coconut milk for jimson weed, heteroauxin and thiamin for pine). This method has been found useful with tobacco, tomato, radish, cotton, lily, violet, ginkgo, cherry, apple, pear, peach, plum, apricot, rose, and olive."

543. L....., W. 575:633.1:007
Ferdinand von Lochow zum Gedenken. Vom Landroggen zum Petkuser Roggen. (**In memory of Ferdinand von Lochow. From land rye to Petkus rye**).
Forschungsdienst 1943 : **16** : 113–14.
This article is an appreciation of the work of von Lochow, pioneer German breeder of live stock and cereals, including the famous Petkus rye and Petkus yellow oat.

*GENETICS 575.1

544. 575.1
HARGITT, G. T. 575.17
What is germ plasm?
Science 1944 : **100** : 343–48.
Consideration is given to the significance of Weismann's theory of the germ plasm, with special reference to the problems of regeneration, dedifferentiation, the reaction between the nucleus and cytoplasm, the nature of the gene, and the self-reproducing properties of bodies containing nucleoproteins.

545. ILTIS, H. 575.1:007
Gregor Mendel and his work.
Sci. Mon., N.Y. 1943 : **56** : 414–23.
A short biography of Mendel is presented and a consideration given to the significance of his pioneer researches on heredity.

546. 575.1:007(52)
633.1:576.16
BLARINGHEM, L. 633.584.3:575.127.2
Seiitiro Ikeno (1866–1943). [**Seiitiro Ikeno (1866–1943)**].
Rev. Hort. Paris 1944: **116** : 44–45.
This is an obituary notice of this Japanese geneticist who is known for his work on the origins of rice and barley, interspecific hybrids of willows and many other branches of botanical and genetical science.

547. SPENCER, W. P. 575.113.3
Iso-alleles at the bobbed locus in *Drosophila hydei* populations.
Genetics 1944 : **29** : 520–36.
A complex multiple allelic series, with iso-alleles forming lethals at one end and maximum bristle type at the other, is characteristic of *D. hydei*.
Several cases of iso-alleles reported by other workers on *Drosophila* are compared with present findings. A discussion of differences in thresholds for phenotypic effects of mutant alleles from species to species and of the possible evolutionary value of iso-allelic series is included.

548. WHALEY, W. G. 575.125
Heterosis.
Bot. Rev. 1944 : **10** : 461–98.
The theories current to-day to explain heterosis are reviewed. After pointing out that the term "heterosis" may be applied variously in different cases, the writer shows that no one theory has been demonstrated to cover all the facts, and that it is much more likely that several different causes may bring about this same effect. Complementary gene action, masking of deleterious recessives, combination of favourable dominants or an effect peculiar to heterozygosity may all be significant.

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* General studies, see also individual crops.

549. *Zhukovsky, P. M. 575.129
(Studies on hybridization and immunity of plants).
Trudy Moskovskoĭ Seljskohozjaistvennoĭ Akademii im. K. A. Timirjazeva (Trans. K. A. Timiriaseff Acad. Agric. Moscow) 1944 : **6** : Pp. 48.

The story of the discovery of *Triticum Timopheevi* Zhuk. and *T. persicum* Vav. is recounted briefly. Hybrids were made between these two species, since both are possessed of valuable properties of resistance, the latter species being resistant to mildew and the former to almost all other wheat diseases. Two fertile amphidiploids and several chimaeras were obtained. The amphidiploids were large and vigorous and bore very large grains. Chromosome counts of the second generation amphidiploids showed $2n = 56$; most cells contained 5–6 nucleoli. The plants are resistant to *Puccinia, Ustilago, Tilletia* and *Erysiphe* and are regarded as constituting a new species *T. fungicidum*. The straw is very strong but the rachis somewhat brittle. The amphidiploids were neither fully fertile nor completely constant.

T. sphaerococcum is thought to be a promising species on account of its spherical grain and was crossed with *T. vulgare* var. *submeridionale* Vav. The F_1 was fully fertile, intermediate in type and displayed heterosis which persisted up to the seventh generation. A certain number of valuable forms were obtained by selection among the progenies. Some of these forms are distinguished by good tillering, very strong and thick straw, wide dark green leaves, large, awned ear and large, barrel-shaped grain which does not shed. Certain other forms have large, entirely spherical grain and strong straw, and are thought to be of special interest from the breeding point of view for this reason.

Secale ancestrale Zhuk., which is hardy in Moscow, has been crossed with cultivated rye varieties and the hybrids are in the fourth generation. They include perennial ryes, forms with large ears and tall straw, forms with large grain and forms with enclosed grain which does not shed.

Haynaldia villosa Schur was crossed in 1928 with *T. dicoccum* var. *farrum*. When the hybrid seed was sown near Leningrad in 1929 all the plants proved sterile, but part of the seed was kept till 1939 and when sown then all plants but one were fertile; they were all amphidiploids and are ascribed to a new genus *Haynatricum* (gen. nov.). The plants are self-pollinating annuals, with rough, glaucous leaves, long, narrow, awned ears, brittle at maturity, with three-flowered spikelets and pubescent glumes with several keels. The grains are long and vitreous, and larger than those of either parent. No segregation or sterility was observed. The chromosome number is $2n = 42$.

The perennial species *Haynaldia hordeacea* Hack., ($2n = 28$) which is extremely resistant to both drought and frost in the region of Moscow, was used to pollinate Vjatka rye and gave a fertile hybrid. The hybrid grains produced on the Vjatka parent differed from typical Vjatka grains. Crosses were made between *Gossypium hirsutum* and *G. barbadense*. The seeds were treated with colchicine and two amphidiploids with $2n = 104$ were produced. They bore numerous flowers but all fell off without fertilization; this is ascribed to the fact that both parental species are themselves amphidiploids and the newly obtained polyploids are thus secondary amphidiploids.

The chromosome number of the tree tomato, *Cyphomandra betacea* Sendtn., has been determined as $2n = 22$. Scions from seedlings of the tomato Everyday were grafted on to seedlings of *C. betacea*; their seed was sown and scions from the seedlings were again grafted on to *C. betacea*. No alteration was observed in the progeny. A scion of Everyday which remained on *C. betacea* for four years however retained its leaves throughout that time and its stem formed cork. A green twig from this scion grafted on a new stock of *C. betacea* took well and later displayed heterosis, in respect both of size and vigour of growth. All through the experiment the tomato scion and the *Cyphomandra* stock retained their respective aromas. Attempts to cross the two plants resulted either in parthenocarpy or inviable seeds.

550. Ipatjev, A. N. 575.22:578.08
Accurate morphological methods for studying varieties.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1944 : **42** : 401–03.

A brief discussion on methods of analysing intravarietal variation is presented. Two techniques are recommended, viz. the "comparative ontogenetic method", where organs corresponding in their place in the developmental sequence are compared; and the "method of diagrams", where conventional representations of the order of appearance of the various organs are contrasted.

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* An extended summary of this bulletin is on file at the Bureau.

551. GOLDSCHMIDT, R. 575.24
On spontaneous mutation.
Proc. Nat. Acad. Sci. Wash. 1944 : **30** : 297–98.

This preliminary note on investigations into the nature of mutation in *Drosophila* suggests that mutation is not at random but is a consequence of pre-existing conditions in the chromosomes. Mutation is envisaged, not as a chemical change within a "gene molecule", but as some form of mechanical re-arrangement within the chromosomes.

552. FREISLEBEN, R. and LEIN, A. 575.243:575:633:578.08
Möglichkeiten und praktische Durchführung der Mutationszüchtung. (**Possibilities and practice of breeding by mutation**).
Kühn-Archiv 1943/44 : **60** : 211–25.

In discussing the possibilities of breeding by mutation, the unpredictability of mutations is considered as counter-balanced by the positive sources of advantage, such as the artificial selection value of mutations, the occurrence of T. Ressovsky's heterogenic character groups, pleiotropy, and the value of small mutations to the breeder, if properly used.
Some of the authors' views on how to carry out mutation breeding in practice have already been set out in previous papers (cf. *Plant Breeding Abstracts*, Vol. XV, Abst. 221). The choice of suitable species and varieties and the technique of irradiation and selection again form the main subjects of information in the present paper.
Irradiation work with the various plant species will necessitate preliminary experiments with each since they react very differently to this treatment.
Biological and chemical tests should be applied in determining and selecting at an early stage mutants not visible to the naked eye.
Many details are given on the planning and execution of breeding operations including some suggestions on possible uses for polyploid forms in connexion with polymerically conditioned characters.

ORIGIN OF SPECIES 576.1

553. BABCOCK, E. B. 576.12
New light on evolution from research on the genus *Crepis*.
Amer. Nat. 1944 : **78** : 385–409.

This version of the Faculty Research Lecture for 1944 at the University of California, collates the various items of evidence bearing on the evolution of the genus *Crepis*, and utilizes the results to substantiate the neo-Darwinian theory of evolution.

554. *SINSKAJA, E. N. 576.16:582
(**The species problem in modern botanical literature**).
Uspehi Sovremennoĭ Biologii (Advances in Modern Biology) 1942 : **15** : 326–59.

This general review of the present conceptions of the nature of the biological species opens with a discussion on the nature of biological variation, whether continuous or discontinuous. The importance of continuous variation is affirmed and is treated in the light of the cline concept, examples of intraspecific and interspecific clines being cited from the Russian literature and from papers written in other countries.
The importance of natural selection is considered next and the author concludes that it represents the most significant factor in evolution. It is regarded as acting "creatively", i.e. not merely as an eliminative factor, but as an actual cause giving rise to variations and determining their nature. Other factors such as isolation, hybridization, polyploidy and breeding systems are regarded as being of lesser significance.
Great importance is attached to recent studies on ecotypic differentiation, which are held to demonstrate the "creative" role of natural selection. The criteria for distinguishing between ecotypes are described and used to contribute towards a tentative definition of the species which is framed as follows: "a species is that stage of the evolutionary process when the whole complex of closely related populations, originating from the same source, forms, in the process of adaptation to the area of distribution, a system of ecotypes and geoecotypes which do not overlap

* A full translation of this paper is on file at the Bureau.

spatially and which do not form, over a greater part of the area of distribution, a direct continuation of another species system". Dobzhansky's definition of the species, which emphasizes interspecific sterility, is rejected as not stressing sufficiently the role of natural selection.
The views of Heribert-Nilsson, Reinig, Meyer, and in particular Willis, which do not place such an extreme emphasis on the importance of natural selection are criticized, also the movement which seeks to separate taxonomy from phylogeny. Such schools of thought are thought to be retrograde and to underestimate the importance of "Darwinian" concepts.

*CYTOLOGY 576.3

555. MIRSKY, A. E. 576.31:581.192
Chromosomes and nucleoproteins.
Adv. Enzymol. 1943 : **3** : 1-34.

A review is given of the history and present position of research into nucleoproteins. Chemical investigations and physical methods such as ultra-violet spectroscopy are discussed, also the techniques of separating the various cell components for chemical analysis. The significance of nucleoproteins both in the nucleus and in the cytoplasm is considered, and the author concludes by a short account of the nucleoproteins of the viruses.

556. FROLOVA, S. L. 576.312.341
Study of fine chromosome structure under enzyme treatment.
J. Hered. 1944 : **53** : 235–46.

An illustrated account is given of the action of nucleases and pepsin on chromosomes. With the nucleases alone, the chromosomes cease to stain with Feulgen's reagent, presumably through the splitting off of desoxyribose nucleic acid. The residue however still retains the form of the original chromosome and can be stained by suitable reagents. When pepsin is added to this residue, almost the whole is digested. It is believed that the chromosomes consist of chromonemata embedded in a matrix or chromoplasm similar in constitution to the cytoplasm and nuclear plasm. This suggestion would account for the partial digestion by the nucleases both of the cytoplasm and the chromosomes, which are both believed to contain ribonucleic acid.

557. CORNMAN, I. 576.35
A summary of evidence in favour of the traction fiber in mitosis.
Amer. Nat. 1944 : **78** : 410–22.

The following theories of chromosome movement are considered (*a*) passive transportation, (*b*) movement of the chromosomes by surface tension differences, (*c*) attraction between the centromere and spindle pole, (*d*) repulsion between the daughter centromeres, (*e*) pulling apart of the daughter centromeres by a "phragmoplast", and (*f*) spindle fibre contraction. All are rejected save the last, especially on the grounds that they do not cover the experimental results obtained by centrifuging. It is therefore suggested that the centromeres of the metaphase chromatids become attached to spindle fibres and have the power to cause the fibres to contract.

558. MARSHAK, A. and
BRADLEY, M. 576.35:537.531
X-ray inhibition of mitosis in relation to chromosome number.
Proc. Nat. Acad. Sci. Wash. 1944 : **30** : 231–37.

A chromosome series of grass species [*Triticum monococcum* ($2n = 14$), *T. dicoccum* ($2n = 28$), *T. vulgare* ($2n = 56$), *Bromus carinatus* ($2n = 56$), *Bromus arizonicus* ($2n = 84$)] has been subjected to X-irradiation in order to ascertain the mechanism of mitotic inhibition. No proportionality between degree of inhibition and chromosome length was discovered, but a relationship of inverse proportionality was observed between the degree of inhibition and the chromosome number.
This result is interpreted as indicating that mitotic inhibition occurs through the inactivation of one or a group of non-uniformly distributed bodies on the chromosomes. Further considerations suggest that the body suffering inactivation might well be the centromere.

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* General studies, see also individual crops.

559. GAVAUDAN, P. and
GAVAUDAN, N. 576.353:581.04:633.11
Action du benzène et de ses homologues sur la caryocinèse et la cytodiérèse végétales. (**Action of benzene and its homologues on mitosis and cell division in plants**).
C.R. Soc. Biol., Paris 1943 : **137** : p. 50.

Root tips of *Triticum vulgare*, when treated with benzene, toluene, propylbenzene, *iso*-butylbenzene or *p*-cymene, have been found to exhibit the following irregularities: rotation of the mitotic axis, pluripolar mitosis, aberrant chromosomal segregation and bridge formation. It is suggested that the symmetrical properties of hexamethylbenzene would prevent its behaving in a similar way.

560. SAEZ, F. A. 576.356:581.039:633.378
Alteraciones experimentales inducidas por la acción de la gravedad en las células somáticas de "*Lathyrus Odoratus*" (Leguminosae). (**Experimental changes induced by the action of gravity on the somatic cells of *L. odoratus***).
An. Soc. Cient. Argent. 1941 : **4** : 139–50.

The contents of the root-tip cells of *L. odoratus*, when subjected to centrifugal forces of 3000 to 6000 times that of gravity, were shown to be stratified according to their respective densities. The consequent displacement of certain of the metaphase chromosomes was shown to have resulted in many nuclei possessing anaphase bridges or aberrant chromosome numbers. J. G. H.

561. GAVAUDAN, P. 576.356:581.04
Etude quantitative de l'action mito-inhibitrice des substances aromatiques: définition et terminologie des effets cytologiques utilisés comme test. (**Quantitative study of the mitosis-inhibiting action of aromatic subtances: definition and terminology of the cytological effects used for testing**).
C.R. Soc. Biol., Paris 1943 : **137** : 281–83.

The distinction made by some authors between "paradichlorobenzenic" and "colchicinic" aberration-inducing substances is rejected. The same chemical substance may produce the effects characteristic of both of these type substances when applied to different plants, and also when applied in different concentrations to the same plant. In general, with increasing concentration, the following effects are observed: (1) tropokinesis, in which rotation of the spindle axis accurs; (2) merostathmokinesis, in which anaphase is aberrant; and (3) stathmokinesis, in which anaphase and cell division are completely inhibited.

562. GAVAUDAN, P. 576.356:581.04
Etude quantitative de la mito-inhibition dans la cellule végétale: description d'une technique applicable a divers essais pharmacodynamiques. (**Quantitative study of mitotic inhibition in the plant cell: description of a technique applicable to various tests of the activity of pharmacological substances**).
C.R. Soc. Biol., Paris 1943 : **137** : 342–43.

The concept of iso-mitotis-inhibiting concentration is introduced and defined as the molar concentration of a dissolved substance able to induce mitotic aberrations in the root tips of wheat. Details of standardization are given. Among the substances exerting an inhibitory effect on mitosis, the following are mentioned: phenylurethane, acetophenone, ethyl *p*-aminobenzoate and butyl *p*-aminobenzoate.

563. GAVAUDAN, P. and
GAVAUDAN, N. 576.356:581.04
Analogie entre les effets exercés sur la caryocinèse et la cytodiérèse végétales par le chloroforme et les substances aromatiques. (**Analogy between the effects exerted on mitosis and cell division of plants by chloroform and aromatic substances**).
C.R. Soc. Biol., Paris 1943 : **137** : 509–10.

Chloroform is able to produce mitotic irregularities such as rotation of the spindle axis and aberrant anaphase. Its mode of action is compared to that of aromatic substances and the author emphasizes the importance of physical properties, also the analogy with narcotization. The toxic effect of some substances precludes their being used in sufficient concentration to induce polyploidy.

564. Steinitz, L. M. 576.356:581.04
The effect of lack of oxygen on meiosis in *Tradescantia*.
Amer. J. Bot. 1944 : **31** : 428–43.
Absence of oxygen has been shown to result in anomalous meioses in the case of *Tradescantia*. Prophase appears to be the sensitive stage and the following aberrations have been observed: (*a*) lengthened prophase, (*b*) decreased terminalization, (*c*) chromosome fragmentation, (*d*) lagging chromosomes, (*e*) restitution nuclei, (*f*) anomalous chromosome distributions, and (*g*) formation of inviable giant microspores.

565. Chopinet, R. 576.356.5:581.02
Autopolyploïdie expérimentale. (**Experimental autopolyploidy**).
Rev. Hort., Paris 1944 : **116** : 53–54.
A note summarizing known facts about autopolyploidy and its different causal agents is presented. French papers on the subject are listed in the bibliography.

566. Thomas, J.-A. 576.356.5:581.04
Evolution nucléaire de l'oeuf d'Oursin en segmentation, après blocage de la mitose par la 4-oxy-4′-aminodiphénylsulfone (98 G). (**Nuclear development of the sea-urchin egg in segmentation, after blocking mitosis with 4-oxy-4′-aminodiphenylsulphone 98 G**).
C.R. Soc. Biol., Paris 1943 : **137** : 12–13.

Thomas, J.-A.
Essais sur le mécanisme de l'action mitoclasique des sulfamides et des sulfones, chez l'oeuf d'Oursin en segmentation. Evolution de la sensibilité des larves au cours du développement. (**Investigations of the action of sulphamides and sulphones in arresting mitosis on the egg of the sea-urchin in segmentation. Development of the sensitivity of the larvae during ontogeny**).
Ibid. 1943 : **137** : 38–39.
A brief account is given of the action of sulphones on mitosis and possible explanatory hypotheses are considered. With 4-oxy-4′-amidodiphenylsulphone, an apparently tetraploid restitution nucleus is formed in which the chromosomes remain at first distinct.

567. Berger, C. A.,
Witkus, E. R. and
Sullivan, B. J. 576.356.5:581.04:635.25
The cytological effects of benzene vapor.
Bull. Torrey Bot. Cl. 1944 : **71** : 620–23.
C-mitotic effects have been obtained by treating *Allium Cepa* with benzene vapour. The presence of four strands in mitotic metaphase was brought out by such treatment.

568. Gustafson, F. G. 576.356.5:635.64:577.17
Growth hormone studies of some diploid and autotetraploid plants.
J. Hered. 1944 : **35** : 269–72.
It has been found that the autotetraploid marigold, Guinea Gold, has 58·1% as much growth hormone as the diploid, the autotetraploid of the marigold, Golden West, 76·3% as much as the diploid, and the autotetraploid of *Lycopersicon pimpinellifolium* 56·84% as much as the diploid.

MICROSCOPIC TECHNIQUE 578.6

569. Richards, O. W. 578.6
Phase difference microscopy for living unstained protoplasm.
Amer. J. Bot. 1944 : **31** : No. 8 : p. 12s. (Abst.).
By inserting phase changing plates into a microscope, it is possible to view differences of refractive index as differences in light intensity. This is of value when investigating the fine structure of living unstained protoplasm.

570. Pavlovskiĭ, E. N. 578.65
(**The use of oil from *Juniperus turcomanica* B. Fedtsch. in microscopy**).
Priroda (Nature) 1943 : No. 4 : p. 90.
The oil obtainable by extracting the berries and foliage of *J. turcomanica* is recommended for use in microscopy. It differs in composition from the usual juniper oil and bears a resemblance to cedar wood oil. It is readily soluble in 96% alcohol and can be used for cleaning without a preliminary passage through absolute alcohol and xylol.

571. TORSSELL, R. 581.162.3:581.46:633.32
Biodlingens betydelse i lanthushållningen. **(The importance of apiculture in agriculture and horticulture in Sweden).**
K. LantbrAkad. Tidskr. 1944 : **83** : 218–39.

Recognizing the great economic importance of bees in the pollination of clovers and other crops, research workers in Sweden and other countries have studied the role of the bee in clover seed production.
The State Plant Protection Institute (Statens Växtskyddsanstalt) and the Association of Swedish Bee Keepers (Sveriges Biodlares Riksförbund) subsidized by the government have investigated conditions of fertilization in red clover. Length and width of corolla tube, which are probably important factors in pollination by bees, have shown significant differences in red clover strains. Earliness too is of importance for the work of the bees. By selection of strains or by breeding it should be possible to obtain red clovers suitable for bee pollination.
Relevant work in other countries is cited in a bibliography of 60 references.

572. SANZ, C. 581.331.23:581.14:576.356.5
Pollen germination and pollen-tube growth of various species of *Solanaceae* and other families in pistils of *Datura Stramonium*.
Amer. J. Bot. 1944 : **31** : No. 8 : p. 5s. (Abst.).

Four types of behaviour have been noted when pollen from other species is sown on the styles of *Datura Stramonium*, viz. (*a*) failure of pollen to germinate, (*b*) bursting of all the pollen tubes after germination, (*c*) bursting of some of the pollen tubes, and (*d*) normal development. Using tetraploid instead of diploid plants of *D. Stramonium* may prevent the bursting of the pollen tubes.

573. ANDERSON, E. and SCHREGARDUS, D. 581.4:578.08:575.22
A method of recording and analyzing variations of internode pattern.
Ann. Mo. Bot. Gdn 1944 : **31** : 241–47.

A technique for recording and analysing variations in internode pattern is discussed, with reference to its use in taxonomic, genetic and physiological investigations.

574. SANDERS, M. 581.481:581.14:575.127.2
Abnormalities in the development of interspecific hybrid embryos in *Datura*.
Amer. J. Bot. 1944 : **31** : No. 8 : p. 5s. (Abst.).

The developmental anomalies of interspecific *Datura* hybrids are briefly described. Excised embryos may develop normally, may remain undifferentiated, or may produce root or shoot like emergences, often exhibiting aberrant tropic behaviour.

575. BLAKESLEE, A. F. 581.481:581.165.71:578.08
Micro-grafting, a method of securing seedlings from excised embryos which fail to develop roots.
Amer. J. Bot. 1944 : **31** : No. 8 : p. 1s. (Abst.).

"A method is described whereby small embryos either from artificial cultures or from mature seeds may be grafted onto normal stock of *Datura stramonium* with protection against evaporation by means of gelatine capsules". [Author's summary].

576. LA RUE, C. D. 581.483:581.4
Regeneration of endosperm of gymnosperms and angiosperms.
Amer. J. Bot. 1944 : **31** : No. 8 : p. 4s. (Abst.).

Excised gametophytes of *Zamia floridana*, both with or without an embryo present, have given rise in culture to shoots and roots. Roots have developed from the excised endosperm of castor beans.

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*General studies, see also individual crops.

577. DELBRÜCK, M. 632.3:575.242:519.24:578.08
A statistical problem.
J. Tenn. Acad. Sci. 1944 : **19** : 177–78.
[From Biol. Abstr. 1944 : **18** : Sect. A. : 15405].

"The mathematical problem of calculating the distribution of the number of bacteria of a mutant type, in series of similar cultures, is formulated". [Author's summary]. (Cf. *Plant Breeding Abstracts*, Vol. XIV, Abst. 486).

578. CROLAND, R. 632.3:575.243:537.531
Action des rayons X sur la fréquence d'une mutation bactérienne. (**Action of X-rays on the frequency of bacterial mutation**).
C.R. Acad. Sci. Paris 1943 : **216** : 616–18.

It has been found possible, by means of X-irradiation, to increase the mutation rate of forms of *Moraxella Lwoffi* var. *brevis* unable to utilize succinic acid as their sole source of carbon to a type able to utilize this acid. The frequency of mutation is a function increasing with the X-ray dosage.

579. BJÖRLING, K. 632.421.6:576.16
Undersökningar rörande klöverrötan. II. Studier av utvecklingshistoria och variation hos *Sclerotinia trifoliorum*. (**Investigations on clover rot. II. Studies on the developmental history and variation of *Sclerotinia trifoliorum***).
Medd. Växtskyddsanst. Stockh. 1942 : No. 37 : Pp. 154.

The histology, the morphology and the cytology of *S. Trifoliorum* are described in detail and a special study is made on variation. The presence of different biotypes is demonstrated when the same agar plate is inoculated into different strains. After a few days at room temperature a definite white line of microconidia shows where two different biotypes are in contact. The results are discussed in detail. R. M. I.

580. EULER, H. VON,
AHLSTRÖM, L. and
HÖGBERG, B. 632.422.3:537.531:581.04
Veränderungen der Hefezellen durch Röntgenstrahlen und durch chemische Substanzen. (**Alteration of yeast cells through X-rays and through chemical substances**).
Hoppe-Seyler's Ztschr. Physiol. Chem. 1942 : **277** : No. 1–2 : 1–25.

Yeast cells treated with X-irradiation have been shown to divide less rapidly than the untreated controls. There is also an increase in the number of dead and degenerate cells and a decrease in the content of nucleic acid. The size increase noticed at first tends to disappear gradually.
Very dilute colchicine solutions have little effect on the rate of cell division in yeast, while stronger concentrations retard it. Degenerate cells are produced but the conspicuous size increase appears to be largely due to osmotic effects. No conclusive evidence of induced polyploidy was obtained.
Colchicine appears to increase the susceptibility of yeast cells to X-irradiation.

581. VUČKOVIĆ, V. 632.422.3:576.16(49.7)
(**Comparative investigation of the yeasts Dingač, Pijavičina, M.O. and Sherry**).
Arhiv Minist. Poljopr. 1940 : **7** : No. 18 : 111–22.

The yeast from the zones producing the famous Dingač wine was studied and is described; the yeast from the Pijavičina region was found to be identical with it, both morphologically and physiologically. It is thought probable that they could be found in other parts of Dalmatia too. They have a high oxidizing capacity, like the Sherry yeasts, and are only suitable for musts with high sugar content.

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* General studies, see also individual crops.

582. RENAUD, J. and LACASSAGNE, A. 632.422.3:576.35:539.164
Anomalies fixées de la division, chez une race de levure obtenue par irradiation). (**Fixed anomalies of division in a race of yeast obtained by irradiation**).
C.R. Soc. Biol., Paris 1943 : **137** : 51–52.
By treating variety Chambertin of *Saccharomyces ellipsoideus* with α rays, a strain has been obtained in which nuclear division precedes bud initiation.

583. LINDEGREN, C. C., SPIEGELMAN, S. and LINDEGREN, G. 632.422.3:581.1:575.11
Mendelian inheritance of adaptive enzymes in yeast.
Proc. Nat. Acad. Sci. Wash. 1944 : **30** : 346–52.
Saccharomyces carlsbergensis is able to adapt itself to melibiose fermentation both in its diploid and haploid forms. The corresponding forms of *S. cerevisiae* lack this ability. From the results of genetical studies of the progenies of the inter-specific hybrid of these two species, it is suggested that *S. carlsbergensis* carries two dominant genes both determining the capability of adaptation to melibiose, while *S. cerevisiae* carries the recessive allelomorphs.

584. LURIA, S. E. 632.8:575.242:632.3
Mutations of bacterial viruses affecting the host-range, and their relation to bacterial mutations.
J. Bact. 1944 : **47** : 416–17.
A mutant virus strain (γ^1) has been observed which is able to attack the strain A of *Escherichia coli* which is resistant to the original γ virus strain. Strains γ and γ^1 of the virus are not distinguishable by serological cross-inactivation tests.

585. GIDDINGS, N. J. 632.8:576.16:633.63
Additional strains of the sugar-beet curly top virus.
J. Agric. Res. 1944 : **69** : 149–57.
Ten strains of the sugar beet curly top virus are described, together with an account of their behaviour towards differential hosts.

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586. RIVOIRE, P. 633:575.12:575.74
Comment lutter contre la dégénérescence des végétaux. (**How to combat degeneration in plants**).
Rev. Hort. Agric. Afrique Nord 1942 : **46** : 7–11.
A popular, semi-humorous note is presented on instances of degeneration in various ornamental and other plants, including the potato. The remedy suggested is hybridization with wild types.

587. REINHARDT, FR. 633–1.531.12(43.8)
Der Aufbau des Saatgutwesens im General-Gouvernement. (**The system of seed production evolved in the General Government**).
Kühn-Archiv 1943/44 : **60** : 204–10.
The organization of seed production and control by the German civil authorities in Poland is described. The area under seed for certification is stated to have risen from 5000 ha. before September 1939 to 130,000 hectares when the article was written (1943–44).

588. 633.00.14(47)
(**Principal varieties of farm and herbage crops for the eastern districts**).
Sovhoznoe Proizvodstvo (State Farming) 1943 : No. 10–11 : p. 49.
In this short communication a list of suitable varieties of cereals, sunflower, and perennial herbage plants, as approved by the Peoples' Commissariat of State Farms of the U.S.S.R. for growing in the eastern regions of the country, is given for each of the eleven territories and provinces. It comprises varieties of winter and spring wheat, winter rye, wheat-rye hybrids, oats, barley, millet, peas, sunflower, lucerne and clover for the Altaĭ and Krasnojarsk Territories and for the Novosibirsk, Omsk, Čeljabinsk, Akmolinsk, Pavlodar, Northern Kazahstan, Kustanaĭ, Semipalatinsk and Eastern Kazahstan Provinces. H. F.

589. ROEMER, TH. 633.1:575(43)
Mehr und besseres Brotgetreide. Pflanzenbauliche und pflanzenzüchterische Fragen unserer Zeit. (**More and better bread cereals. Problems of our time in plant cultivation and plant breeding**).
Forschungsdienst 1943 : **16** : 115–23.

The author discusses: factors underlying satisfactory milling and bread production; the relative importance of the wheat and barley crops in past and present Germany; the introduction in the past of foreign wheats and the breeding programme to combine high yield with winter hardiness and resistance to lodging; variety trials and also seed certification in Germany; and official registration of new varieties.

"Latent germination"* is specially mentioned as a genetically conditioned character which it should be possible to eliminate from wheat and rye by (1) taking advantage of what is already known of its genetical basis in wheat and, by (2) methods of breeding suitably modified to suit those two crops with their different mode of pollination. It is suggested that, from the law of parallel variation, it can be postulated that latent germination may follow the same laws of inheritance in both rye and wheat.

Annotated illustrations are also given dealing with Rimpau, the pioneer of cereal breeding in Germany, with the Seed Production centre at Petkus, and with baking quality.

590. WAHLEN, F. T. 633.1:575(43)
Bericht über die Tätigkeit der Eidg. Landwirtschaftlichen Versuchsanstalt Zürich-Oerlikon für die Jahre 1938 bis 1942. (**Report on the activities of the Federal Agricultural Research Institute Zürich-Oerlikon for the years 1938 to 1942**).
Landw. Jb. Schweiz 1944 : **58** : 317–416.

This report includes the following plant breeding items:—

Wheat

The need for a wider range of breeding material is emphasized. The following crosses have been made: Nostrano x Bisnachter, M.C. 245 x Strickhof, Nostrano x Strickhof, Bisnachter x Huron, Bisnachter x Plantahof, Nostrano x Huron, M.C. 245 x Nostrano, Tassilo x Strickhof, Rimpau's Early Hybrid x Rothenbrunner, Graf Toerring [Count Toerring] x Strickhof, Engelen's Siegfried x Plantahof, Graf Toerring x Strickhof, Hornussen 24 x Tassilo, Plantahof x Tassilo, Trubilo x Plantahof, Strickhof x Tassilo, M.C 245 x Tassilo, Graf Toerring x Plantahof, Todaro x Strickhof, Ardito x Nostrano, Di Cologna x Plantahof, Giro Menotti x Nostrano, Mentana x Nostrano, Villa Glori x Nostrano, Todaro x Plantahof, Du bon Moulin [From the Good Mill] x Plantahof, Nostrano x Vilmorin 27, Mentana x Kadolzer, Damiano Chiesa x Kadolzer, and Todaro x Tassilo.

Spelt

Selection from material not previously treated by breeders has been pursued and one line has been produced which exceeds the standard variety Oberkulm in yield and resistance to lodging. A collection of land races of spelt has been made from Switzerland, Vorarlberg, Upper Swabia, the Black Forest, Swabian Alb, Bauland, Eifel, the Ardennes and Asturias.

Oats

Breeding continues although few promising forms have been produced yet.

Rye

Improvement of rye in respect of winter-hardiness and standing capacity is proving a slow process and hybridization between the Swiss material and a foreign variety is to be tried. Land races are to be investigated for the development of varieties adapted to high altitudes, the Fellers mountain rye being the most promising. A breeding station at an altitude of 1400 m. was instituted in the autumn of 1942.

Maize

Inbred lines are being developed and one has been discovered that is resistant to *Puccinia Maydis*. Efforts are also being made to improve the Rheintaler maize.

Barley

This crop is being bred by means of selection and hybridization for earliness and resistance to lodging and diseases. Strain No. 17 is recommended for areas with a low incidence of rain, wind and thunder storms. Riniker is recommended on account of its earliness, yielding capacity and resistance to lodging.

*i.e. the initiation of physiological changes within the grain.

591. ZIEGENBEIN, G. 633.1:575:578.08(43)
Arbeitsweise und Erfolge in der Hafer- und Gerstenzüchtung an der Pflanzenzuchtstation der Universität Halle. (**Method of work and results in the breeding of oats and barley at the Plant Breeding Station of the University of Halle**).
Kühn-Archiv 1943/44 : **60** : 440–54.

This is a 10-year survey following that reviewed in *Plant Breeding Abstracts*, Vol. IV, Abst. 635 (cf. also Abst. 600).

Two varieties of oats have been released to growers, Breustedts Widukind, a high-yielding white oat resistant to lodging, and Endress Hadilo, which is early and high yielding. In 1943 two loose smut resistant strains were undergoing official tests and 5 others were being tested in the variety register to eliminate synonyms. The procedure used in breeding for loose smut resistance combined with quality, resistance to lodging and white ear (Flissigkeit) is described.

Breeding for resistance to germination in the ear (cf. Abst. 600) has been in progress for some years and strains have been evolved in which germination is delayed 20 days or more and which are resistant to loose smut and equal the control varieties in yield, though unfortunately not yet in resistance to lodging. The method of selection used makes it possible to detect in individual plants the tendency to germination in the ear.

In 1941 the high-yielding, winter barley Breustedts Schladener I from (Eckendorfer x Schwarze Wintergerste) x Friedrichswerther, which shoots about two days earlier than Mahndorfer, was recognized as a pedigree variety. Another equally stiff strawed, winter-hardy and productive strain is No. 1884_{32} from the cross 1323_{25} (Eckendorfer x Schwarze Wintergerste) x 48_{22} (from Schliephakes two-rowed).

Since imported barleys fail to stand the severe winter conditions in Halle, it would seem that breeding for transgressive forms offers the only chance of success; and some hybrids of Friedrichswerther x Mahndorfer, Kalkreuther x Tokuji and Kalkreuther x Cape Coast have shown increased hardiness. Tokuji is a Japanese spring barley, and Cape Coast an American alternative variety; both carry genes for winter-hardiness.

The combination of forms, not closely related and therefore bearing different genes for winter hardiness, has been attempted, using (1) material in which genes originating from Eastern Asia and America are present with German gene material; and (2) Russian, French, American and Turkish varieties.

Smooth awned types constitute another objective at the Halle Station. It has been noted that four-rowed winter barleys do not exhibit the gapping so common in the two-rowed smooth awned spring barleys.

The station has also been engaged upon the problem of combining resistance to loose smut and stripe disease with mildew resistance, as well as winter hardiness and good yield. The method of infection used is mentioned.

The combination of loose smut resistance and smooth awns has appeared and strains have also been found that are resistant to both loose smut and stripe.

Nearly all the strains with good yields in the barley material used in breeding are resistant to germination in the ear, as a result of the introduction of this character by hybridization with an old black winter-hardy barley.

A similar programme is being followed with regard to spring barley; the early Morgenrot (Dawn) variety is mentioned as a product of the station. Investigations have been made by Thielebein on the inheritance of protein content in pure lines and crosses of spring barley, with a view to increasing this character in breeding; this thesis has however not yet been published.

592. YOUNG, L. W. 633.1–2.451–1.521.6:575.007
Obituary—Edward Franklin Gaines.
Science 1944 : **100** : 241–42.

This obituary notice refers to the late Dr Gaines' achievements in breeding cereals for smut resistance.

593. MCFADDEN, E. S. and
MCDOWELL, C. H. 633.1–2.452–1.521.6:575(76.4)
New rust-resistant small grains for south and central Texas.
Progr. Rep. Tex. Agric. Exp. Sta. 1943 : No. 850 : Pp. 3. (Mimeographed).

The work done by the Agricultural Experiment Station of Texas in the production of rust

resistant cereals is reviewed, and the following varieties are described: Austin wheat, Ranger, Rustler and Verde barleys, and Tunis oats. These varieties have already been reported in *Plant Breeding Abstracts* (cf. Vol. IX, Abst. 960, Vol. XIV, Abst. 517).

594. PELSHENKE, P. 633.1:664.641.016
Zwölf Jahre Schrotgärmethode. (**The meal fermentation method after 12 years**).
Kühn-Archiv 1943/44 : **60** : 265–87.
This paper with a bibliography of 193 references gives a critical survey of the various factors which must be taken into account in using the meal fermentation test for quality of cereals in breeding operations or trials of varieties and strains.

595. 633.1:664.641.016:575
Probleme der Brotnahrung im Kriege. (**Problems of bread as a food in war time**).
Forschungsdienst 1943 : **16** : 145–46.
Professor M. G. F. Wirz, speaking at a first meeting of the German Labour Group to Promote Science and Technology in the Cereal Industry (Arbeitsgemeinschaft zur Förderung von Wissenschaft und Technik in der Getreideverarbeitung), referred to: (1) the relative importance of breeding for increased grain yield and for higher protein, and (2) the problem of breeding cereals that will absorb less water and will therefore give in wet years a better quality of grain and flour.

WHEAT 633.11

596. QUISENBERRY, K. S.,
WEBSTER, O. J. and
KIESSELBACH, T. A. 633.11(78.2)
Varieties of winter wheat for Nebraska.
Bull. Neb. Agric. Exp. Sta. 1944 : No. 367 : Pp. 20.
Wheats suitable for Nebraska are described and an account given of their breeding history and regional adaptability.

597. ŠEHURDIN, A. 633.11:575(47)
(**New Saratov varieties of spring wheat**).
Sovhoznoe Proizvodstvo (State Farming) 1943 : No. 1–2 : 26–28.
The variety Lutescens 53/12 was produced by complex hybridization between a Turkestan wheat and a number of forms bred by the Saratov station. It has out-yielded Lutescens 62 and Sarubra by 1·28 and 0·58–1·0 centners per hectare respectively; it is possessed of high milling and baking qualities and is free from shedding.
Albidum S–21 was produced by crossing Lutescens 2074 x Saroza; it has excelled Lutescens 62 and Sarubra in yield by 0·2 to 1·6 centners per hectare and has compared well with the very drought-resistant variety Erythrospermum 841. It has high milling and baking qualities, is free from shedding and resistant to bunt.
Albidum S–43 was also obtained by complex hybridization; it has yielded 1·24–3·65 centners per hectare more than Erythrospermum 841 and 2·72–3·47 more than Sarubra. It is a very early variety, coming into ear four to eight days sooner than Lutescens 62, and is drought resistant; it therefore yields well in dry years as well as in good years.
Two varieties resistant to brown rust, lodging and shedding, Lutescens 605 and Lutescens 758, have yielded 5–6·3 centners per hectare more than Lutescens 62, both on irrigated and unirrigated land.
The awnless *T. durum* forms, Candicans 75/09 and others, have given promising results in a number of localities.

598. TSAI, H. 633.11:575(51)
(**Studies on Szechuan wheat**).
Tech. Bull. Szechuan Agric. Exp. Sta. 1942 : No. 2 : Pp. 170.
The report presents the results of the work on Szechuan wheat carried out by the station for the past 5 years. A general survey is given on the natural environment, production and consumption, planting and processing practice and growth habit of wheat in Szechuan. Three species, *T. vulgare*, *T. turgidum* and *T. compactum*, are in cultivation. More than 140 varieties of *T. vulgare* can be identified, about 20 of them of wide distribution. Because of the impurity of

seeds, susceptibility to rust and liability to lodging the yield is irregular. In hilly districts *T. turgidum* is widely cultivated on account of its high yield, late-sowing requirement, and wind-resisting properties.

Field observations were made on the growth habit and developmental stages of the different varieties. Large variations were found to be due to different climatic conditions, especially temperature.

Trial plantings were made with some 1700 introduced and indigenous varieties in Chengtu for 3 years. Large differences in response were found in wheats of different origin. In general the native varieties are susceptible to rust and the foreign varieties are too late in ripening. Only a few varieties can be introduced with profit to Szechuan. A few more appear to be useful for hybridization work. The most promising varieties are Villa Glori, Fawn, Ardito and Chungta 2419 (of Italian origin). Owing to the non-uniformity of climatic conditions and cultivation practice, careful experimentation in different districts must precede extension work.

Pure line selection work has been conducted on the native varieties for 6 years. Three promising strains have been found (1–13, 7–18, 7–42), but their resistance to rust and lodging is not entirely satisfactory. In order to combine high yield, early ripening, rust resistance and strong straw, hybridization work was started in 1936. A large number of crosses and back-crosses were made each year with indigenous and imported varieties. Some F_3 hybrids from 5 crosses were selected and planted for trial in Mienyang, Hochuan and Chengtu. A few strains of F_5 and F_6 hybrids of 3 crosses have been stabilized and are being tried out for yield. Some show very promising results.

Studies were made on the method of sowing, time of sowing and fertilizer application. Suggestions are given for different varieties in different districts. Another problem studied was the germination of grains before harvest. This tendency was found to be related with the length of after-ripening.

Preliminary studies were also made on the quality of Szechuan wheat using weight-volume ratio as a simple index. Analyses are given for a few of the more important varieties.

A critical review is given on the method, organization and progress of extension work since 1936 and the problems thus far encountered. A plan is suggested for future improvement and extension work, and possible measures for increasing wheat production in the province are discussed. H. C. Y.

599. Heyne, E. G. and Reitz, L. P. 633.11:575(73) 633.11:575.113.7
Characteristics and origin of Blackhull wheats.
J. Amer. Soc. Agron. 1944 : **36** : 768–78.

The history of the Blackhull wheats (Blackhull, Early Blackhull Superhard, Clarkan, Kanhull, Chiefkan and Red Chief), which have been developed by E. G. Clark, is outlined, and varietal descriptions are added. All these varieties appear to carry the lethal complementary factor *Le2*.

600. Becker, H. 633.11:575:578.08(43)
Arbeitsweise und Erfolge in der Weizenzüchtung an der Pflanzenzuchtstation der Universität Halle. (**Methods of work and results in wheat breeding at the Plant Breeding Station of the University of Halle**).
Kühn-Archiv 1943/44 : **60** : 369–401

This paper purports to give a survey of the aims and achievements in wheat breeding at the Halle Station since 1933. The objectives as regards winter wheats include hardiness, high yield and quality as well as resistance to lodging and rusts. Similar aims are being pursued in spring wheat breeding, e.g. good yield, resistance to lodging, rust and germination in the ear, and the possession of high quality and high gluten content.

The progress of the work on the above problems is recorded with notes on crosses made and their performance from time to time (cf. *Plant Breeding Abstracts*, Vol. IV, Abst. 635).

A bibliography is appended.

601. Žukovskiĭ, P. M. 633.11:575.127.2(47)
(**Notes**).
Sovhoznoe Proizvodstvo (State Farming) 1943 : No. 3–4 : p. 47.

Reference is made to a hybrid of *Triticum Timopheevi* x *T. persicum* which is completely resistant to rusts, smuts and mildew, and has exceptionally large grain with a thousand corn weight of 70·65 grm.

602. Cicin, N. V. 633.11:575.127.5:633.289
(Transformation of the nature of cultivated plants).
Sovhoznoe Proizvodstvo (State Farming) 1943 : No. 1–2 : 39–41.

Wheat No. 34085 is a constant non-segregating *Triticum-Agropyron* hybrid, perennial, and exceedingly resistant to drought, diseases, salinity and lodging, but somewhat deficient in frost resistance. Its grain has a very high protein content; it is ribbed however and difficult to thresh. The grain yield in 1940 from autumn sowings in 1939 was 18·2 centners per hectare and the aftermath yielded 13 centners of hay per hectare; in 1941 from autumn sowings in 1940 the figures were 22·4 and 17 centners per hectare respectively. On account of its deficient winter hardiness it cannot produce any further crops in zones with severe winters, but certain newer hybrids have overwintered successfully in open ground in the Moscow area during the last two winters. Several of the hybrids have been grown satisfactorily in collective farms; in one case, for instance, four grain crops were obtained in two years, the total amounting to 55·2 centners per hectare.
Crosses have been made between *Agropyron* and rye too, with the object of raising the protein content in the grain of the latter cereal. The F_1 hybrids were completely sterile but after six years of effort a second generation has now been obtained.
Examples are cited of certain other wide crosses recently effected in the U.S.S.R.

603. 633.11:575.129
*Zhebrak, A. R. 633.11:575.127.2:576.356.5:581.04
(The synthesis of new species of wheats).
Trudy Moskovskoĭ Seljskohozjaĭstvennoĭ Akademii im. K.A. Timirjazeva (Trans. K.A. Timiriaseff Acad. Agric. Moscow) 1944 : **6** : 5–54.

The merits and defects of polyploids are discussed by reference to the literature. The author has produced fertile amphidiploid hybrids of *Triticum durum* x *T. monococcum* and *T. durum* x *T. Timopheevi* by treatment with colchicine. The former proved to have 42 chromosomes and the latter 56. The amphidiploids are described; the 56-chromosome amphidiploid is classed as a new species *T. soveticum*, and is of interest on account of the exceptional size of its grain and unusually high resistance to fungus and insect pests. Similar amphidiploids have been obtained from 19 different varieties of *T. durum*, 6 varieties of *T. turgidum*, 3 varieties of *T. persicum*, 3 of *T. polonicum* and 1 of *T. orientale*. The results of crossing were influenced by the maternal parent; *T. Timopheevi* is a more successful seed parent than *T. durum*. The amphidiploid hybrids arising from different wheat species differ somewhat morphologically but are all ascribed to the one collective species *T. soveticum*.
Amphidiploids of *T. Timopheevi* with *T. vulgare* were only obtained in 1940. These had 70 chromosomes and are classed as *T. Borisovi* Zheb.
One of the features limiting the agricultural utilization of these new amphidiploid wheats is their low fertility, but differences exist between the amphidiploids obtained from different varieties. For instance that from *T. Timopheevi* x *T. durum hordeiforme* 0189 is almost equal to *T. durum* in fertility. Some of the amphidiploids have an average of over three grains per spikelet and the majority of spikelets in the ear contain not less than four grains. The fertility rises somewhat in the later generations, especially when the hybrids are grown under favourable conditions. In 1942 some of the best amphidiploids had up to 55 grains per ear. The different subspecies of the 56 chromosome amphidiploid cross well with one another and a large number of hybrids were produced in 1942.
In the Moscow province, where most forms of *T. durum* are killed off in winter, 9 out of 22 56-chromosome amphidiploids survived the winter of 1941–42; their grain was vitreous and of the *T. durum* type and these would seem to constitute a promising new source of winter-hardy *T. durum* wheats.
It is stated that the amphidiploids are far from being fit to introduce immediately into cultivation; it is maintained however that they possess undoubted practical interest for breeding purposes and a sufficient quantity of seed is now available to supply the requirements of all the breeding stations in the Soviet Union working with wheat. The segregation observed in the second generation continues in the third and fourth generations but these generations also contain certain fairly uniform types which are of definite interest for practical breeding work.

* An extended summary of this paper is on file at the Bureau.

604. LEIN, A. 633.11:575.129:633.14
Über Rückkreuzungsversuche eines amphidiploiden Weizen x Roggen-Bastards mit Roggen. (**Experiments on back-crossing an amphidiploid wheat x rye hybrid with rye**).
Kühn-Archiv 1943/44 : **60** : 226–37.

Previous work on the problem of combining certain desirable wheat and rye characters in a single hybrid is outlined. In the present experiment an attempt was made by back-crossing a wheat x rye hybrid to the rye to obtain forms with a more pronounced rye character. Two *Triticale* forms were pollinated with rye, *Triticale* Rimpau and *Triticale* Meister (= M.56) of Russian origin and probably identical with *T. secalotricum saratoviense* Meister (cf. *Plant Breeding Abstracts*, Vol. II, Abst. 595).

The former gave no set, while the latter gave a set of 23% from 309 flowers pollinated in the largest series of experiments in 1938. In four years (1937–40), 54 F_1 hybrids of M.56 x rye were obtained from which, in spite of their low fertility, a fairly large number of progeny was obtained by vegetative multiplication.

The cytological irregularities of the F_1 of M.56 x rye are described.

Pollen quality was good, but fertility as measured by the set was very bad and the grains set tended to be localized in one ear or even in a few spikelets of one ear instead of at random among all the ears formed.

In the F_2, many plants had 35 chromosomes, while in the F_1 there had been one such plant though the habit of the F_1 and F_2 plants of this kind differed from that of the F_1 specimen and a corresponding difference in the chromosome complement in the F_1 and F_2 plants was also evident from a study of meiosis.

In general there appears to be a tendency towards elimination of the wheat chromosomes and it would seem possible, by repeated back-crossing of the rye-like forms to the rye, to obtain pure 14 chromosome derivatives.

605. FAUVEL, J. H. 633.11:575.243:581.037
Une mutation inattendue du blé mahon. (**An unexpected mutation of the wheat Mahon**).
Rev. Hort. Agric. Afrique Nord 1942 : **46** : 119–21.

Having briefly discussed various ways of inducing mutation and the effects in different plants, the writer describes the results of exposing grains of the wheat Mahon 4, a selection at the Algerian Agricultural Institute (Institut Agricole d'Algérie), to the light of the spark of an induction coil. The resulting mutants matured 10 days earlier than Mahon 4 and appeared to be resistant to diseases and to lodging, while their stems were shorter, more solid and cylindrical and the ears lacked awns.

606. ZHEBRAK, A. R. 633.11:576.356.5:581.04:575.127.2
Production of amphidiploids of *Triticum polonicum* x *Triticum Timopheevi*.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1944 : **43** : 120–21.

A morphological description is given of amphidiploids from the cross *T. polonicum* x *T. Timopheevi*, which have been obtained by means of the colchicine technique.

607. *KONOVALOV, I. N. 633.11:581.143.26.03(47)
(**The physiological characteristics of the influence of vernalization on the growth of plants**).
Sovetskaja Botanika (Soviet Botany) 1944 : No. 3 : 21–36.

Experiments have been carried out at the Timirjazev Institute of Plant Physiology to study the effects of vernalization of seed upon the growth and physiological processes in the leaf, and thus upon the yield. The hard spring wheat *Hordeiforme* 010 was the chief material used. The soft spring wheat *Lutescens* 062, and spring vetch 1394, the semi-winter wheat *Apulicum* 685, the winter wheat Ukrainka, and several varieties of lentils were used to provide further data.

The yield of the late-maturing wheat was increased by vernalization because, although tiller production was reduced, the ears bore better and more numerous spikelets and heavier and more numerous grain. In the early varieties, vernalization did not increase the yield as the good development of the ears could not make up for the reduced number of tillers.

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* An extended summary of this paper is on file at the Bureau.

608. TIMM, E. and
TROGNITZ, K. 633.11:581.6(43)
Die Kleberweizenuntersuchungen 1942/43 der Reichsanstalt für Getreideverarbeitung. (**The gluten wheat investigations 1942/43 of the Imperial Institute for Milling Cereals**).
Z. ges. Getreidew. 1943 : **30** : 102–05.
This report includes details of the gluten content of German wheat varieties.

609. 633.11:582(78)
633.11:575(78)
Dictionary of spring wheat varieties.
Northw. Crop Improvement Ass. Minn. 1941 : Pp. 92.
In this useful booklet, 73 wheat varieties, mostly hard red spring wheats and durums, are described. The value of each variety for growing in Minnesota, Montana and North and South Dakota is discussed and most of the descriptions are illustrated. A few new wheats, not yet released, or insufficiently tested, are included. These are Merit, a bearded, stiff-strawed wheat with good yielding ability, from the cross H–44 x Ceres; Premier, from a compound cross, a variety apparently of unsatisfactory milling quality; Vesta, a variety with some valuable qualities but liable to lodge, resulting from a cross involving Ceres, Hope and Florence; and Regent, from a cross between H–44 and Reward, which may not prove to be fully equal to Thatcher in milling and baking quality, or in yield, except where leaf rust is severe. S. E.

610. WALDRON, L. R. 633.11–1.962.4
How wheats behave in competition with one another.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1944 : **6** : No. 6 : 7–14.
A study of the competitive ability of wheat varieties is presented.

611. JAPHA, B. 633.11–2.111–1.521.6:575(43)
Studien über Frühjahrsschäden an Winterweizen. (**Studies on spring injuries to autumn wheats**).
Kühn-Archiv 1943/44 : **60** : 429–39.
The elaboration of laboratory tests for winter hardiness necessitates an analysis of the individual factors which go to make up the whole winter hardiness complex, which comprises not only frost resistance to true winter frosts, but also to the severe weather of late winter to early spring, termed here, "spring resistance", a character in which genotypic differences also occur. Studies of varietal differences in this type of resistance are recorded from experiments in East Prussia and from experiments with American, English, Swedish, Finnish, Russian, Hungarian, French and German varieties at the Halle Plant Breeding Station. The differences noted are interpreted as the results of natural selection in the various climates.
Some preliminary observations on the causes of spring injury are cited and the author's results are briefly discussed, with relevant literature. Several factors, including the particular variety in question, appear to determine spring injury and further investigations will, it is hoped, identify their respective roles and the varieties carrying factors for resistance to spring damage so that by hybridization and accumulation of such factors resistance may be ultimately attained.

612. PANSE, E. 633.11–2.111–1.521.6:575(43)
Die züchterischen Grundlagen zur Steigerung der Winterfestigkeit bei Weizen mit besonderer Berücksichtigung der Hallenser Züchtungsarbeiten. (**The basis of breeding for increased winter-hardiness in wheat with special reference to the breeding work at Halle**).
Kühn-Archiv 1943/44 : **60** : 402–28.
In German agriculture there is a special need for genuinely winter hardy autumn wheats. The present paper records the effects of the unfavourable winter weather conditions upon the autumn wheats at the Halle Plant Breeding Station. The various kinds of reactions that go to form resistance to winter conditions are set out, with an explanation of the different type of reaction involved in resisting winter frost as compared with the frosts of early spring.
Particulars of the weather conditions are followed by records of the behaviour of wheat varieties and strains at the station during 1938–42.
Crosses in which French varieties were introduced failed to produce the desired type, resistant to lodging and also winterhardy. The French wheats were autumn forms but without any genes for winter hardiness and their use led to an elimination of these genes in the populations.

Winter hardiness was successfully introduced into two groups of crosses, one made with the object of combining this feature and baking quality, and the other to combine disease resistance with winter hardiness. These studies are still in progress.
The relative winter hardiness of wheats of European and other countries is discussed and some observations are contributed on technique in breeding for a combination of high yield, winter hardiness, quality and resistance to lodging.

613. WALDRON, L. R.,
HARRIS, R. H.,
STOA, T. E. and
SIBBITT, L. H. 633.11–2.4–1.521.6:575.12(78.4)
Mida wheat. A new hard red spring variety.
Circ. N. Dak. Agric. Exp. Sta. 1944 : No. 68 : Pp. 16.

Mida is a new hard red spring wheat derived from the combination [Ceres x (Hope x Florence)] x R.L.625. Its straw strength is superior to that of Rival and it is resistant to stem and leaf rusts and to bunt.

614. ZHEBRAK, A. R. 633.11–2.421.1–1.521.6:576.356.5:581.04:575.127.2
Production of amphidiploids of *Triticum orientale* x *Triticum Timopheevi* by colchicine treatment.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1944 : **42** : 352–54.

An amphidiploid hybrid ($2n = 56$) has been obtained from the cross *T. orientale* x *T. Timopheevi*, by means of the colchicine technique. The plants are susceptible to *Erysiphe graminis* in contrast to other hybrids of *T. Timopheevi*, a fact which inclines the author to admit the specific status of *T. orientale* which is a matter of dispute. The amphidiploid is classed as a subspecies of *T. soveticum*.

615. HART, H. 633.11–2.452–1.521.6(73)
Stem rust on new wheat varieties and hybrids.
Phytopathology 1944 : **34** : 884–99.

The possible destructive effect in the Mississippi valley of race 15B of *Puccinia graminis Tritici* is discussed, with special reference to varietal response.

616. AUSEMUS, E. R. and
STAKMAN, E. C. 633.11–2.452–1.521.6:575.12
Newthatch. What it is and what it took to make it.
Minn. Fm Home Sci. **2** : No. 1.

Newthatch, a new hard red spring wheat, produced by back-crossing the hybrid Thatcher x Hope, has high resistance to stem rust and greater leaf rust resistance than Thatcher.

617. HARRIS, R. H.,
SIBBITT, L. D. and
SCOTT, G. M. 633.11:664.641.016
The effect of temperature differences on some mixogram properties of hard red spring wheat flours.
Cereal Chem. 1944 : **21** : 374–85.

The effect of temperature on the curve height and width of mixogram patterns of hard red spring wheat flours is a varietal characteristic.

618. LEONARD, E. H. 633.11:664.641.016
Progress in wheat improvement in the Pacific Northwest.
Bull. Ass. Operative Millers 1943 : p. 1320.

The importance of milling quality in wheat breeding programmes in the Pacific Northwest is emphasized.

OATS 633.13

619. TAYŞI, M. V. 633.13:582(56)
Türkiye yabani yulaflari, formlarin toplanma ve teşhisi, kültür yulafi islahina yarayişlarinin tetkiki. (**Turkish wild oats. Collection and determination of the forms and testing their suitability as initial breeding material**).
T.C. Yüksek Ziraat Enstitüsü Çalişmalarindan, Ankara 1941 : No. 115 : Pp. 56.

Wild oats, collected in eastern and western Anatolia, provided the material for this study. The monograph treats the subject under the following headings: present day oat cultivation in

Turkey; the importance of wild and semi-wild forms for the production of new cultivated varieties; the systematics of *Avena* with analyses of certain *fatua* and *sterilis* forms tested in cultural experiments; other wild oats discovered; summary of the wild oat forms found in Turkey; reproduction; ants as collectors of wild oats; yields of grain; geographical distribution; and the importance of the forms discovered as initial breeding material.

620. Coffman, F. A. 633.13–2–1.521.6:575.12(73)
Results from the cooperative coordinated oat breeding nurseries for 1940, and the uniform winter-hardiness nurseries for 1940–41.
U.S. Dep. Agric., Bur. Pl. Ind., Div. Cereal Crops and Diseases 1941 : Pp. 115. (Mimeographed).

This report on co-ordinated oat breeding nurseries contains, as in previous years, extensive summary tables showing average yields and deviations from comparable averages in each of the three main divisions, viz. mid-season, early-maturing and autumn-sown oats. The winter-hardiness test was made at 36 stations, and has now been conducted for 15 years.

During the last several years many selections from hybrids have been produced on the stations in different areas, which have proved so promising that they may soon supplant the older varieties. Each major section of the report contains a sub-section which summarizes data on these new disease-resistant strains.

Among disease-resistant mid-season hybrids, promising selections have been obtained from the cross Anthony x Rainbow. Several of these are high yielding and stem rust resistant; some have the crown rust resistance of Rainbow, but all the selections are susceptible to smut. Of selections resulting from crossing Bond with other oat varieties, it is probable that a number may prove suitable for growing in the Corn Belt, whereas others appear to be well adapted to those areas where mid-season oats yield best. It seems evident that, in general, selections from cross XM 3218, D 69 x Bond and line 35–1309, are promising, also selections obtained from crosses of Bond with Anthony and Rainbow. Some selections from double crosses between disease resistant segregates from Victoria x Richland with the smut resistant strains C.I. 2574) (Markton x Idamine) and Bannock (C.I. 2592), from Markton x Victory, appear to have much promise, but as yet definite conclusions cannot be made. Many possessing disease resistance, white kernels and stiff straw, yield exceptionally well. Others have been found heterozygous for one or more characters. A sub-group of selections from the same double crosses, which are designated by C.C.D. numbers also contains promising material.

Among early maturing selections made from Markton crosses, those resulting from the cross X2871 (Markton x Rainbow) are most promising. The two most valuable strains from this cross are selection No. 708–3 (C.I. 3247), named Marion, and selection 708–2 (C.I. 3346), named Hancock. Marion has given excellent yields in the Corn Belt, and it has a kernel of exceptional quality. Hancock has averaged in yield about as much as Richland Iowa 105, but as it has a tall, stiff straw, it may have value as a cover crop over clover. Selection 1965 (C.I. 3351), also from the line 708, has yielded well in North Dakota, and has a better straw than Marion, but is slightly later in maturity. Among the selections that have been named from the cross X S1098 (Victoria x Richland) made in 1930, are Boone (C.I. 3305), Tama (C.E. 3502), Vicland (C.I. 3511) and Control (C.I. 3603). All four of these selections are similar in plant characters, and all have resistance to crown and stem rust and smut. They are early, plump-kernelled, yellow oats.

Promising strains have been obtained from crossing segregates of Victoria x Richland with segregates of the crosses Markton x Rainbow or Markton x Iogold, and leading oat varieties of many other types have also been used as parents. These new strains are resistant to stem and crown rust as well as to smut. Some have given excellent yields.

At the start of the programme of breeding disease-resistant, hardy, winter oats, no cold resistant oat was available that had satisfactory resistance to even one of the major oat diseases, and no more than two of the factors for disease resistance were present in any one variety even of spring oats.

Strains from crosses of Victoria with Lee and Hairy Culberson are of particular interest in this programme. They possess resistance to crown rust and smut, high yielding ability and favourable kernel characters. Several of these strains have been named: The Lee x Victoria strain Letoria (C.I. 3392) and Coker-Stanton (C.I. 3855) have been found winter-hardy and promising in respect of yield and quality; closely related selections which may eventually be equally good are Lega (C.I. 3379), Levic (C.I. 3384), Lelina (C.I. 3404) and De Soto (C.I. 3923).

Three Nortex x Victoria strains have been named. These are Ranger (C.I. 3417), Rustler (C.I. 3754) and Rangler (C.I. 3733). Fultex has been selected from the cross Fulghum x Victoria. A fertile field for future selection will probably be provided by the strains produced by crossing or back-crossing Red Rustproof with segregates from Victoria x Richland cross, and also by selections from (Nortex x Victoria) x (Richland x Fulghum). In addition, strains resulting from (Fulghum x Markton) x (Victoria x Richland) have shown promise when grown in the milder sections of the winter oat area.

621. ROSEN, H. R. 633.13–2.452–1.521.6:575.12(76.7)
The 1944 "Arkansas Traveler".
Sth. Seedsman 1944 : **7** : No. 9 : 11, 54.

The new oat variety Traveler is described. It is derived from the cross Victoria x Custis and is characterized by its high yielding capacity, rust resistance and winter-hardiness.

RYE 633.14

622. *TOSUN, O. 633.14:575.127.5:633.11(56)
Bugday x çavdar melezleri. **(Wheat x rye crosses).**
T.C. Yüksek Ziraat Enstitüsü Çalişmalarindan, Ankara 1943 : No. 139 : Pp. 122.

Out of 94 wheat and 26 rye varieties representing numerous species in the Plant Cultivation and Improvement Garden of the Ankara Agricultural Institute, 34 wheats and 3 ryes were selected for inter-generic hybridization. The technique of emasculation, collection of rye pollen and pollination is described in detail. Wheat was used as the female parent in all crosses.

In 1939 and 1940, 14,583 flowers of $n = 7$ and $n = 14$ chromosome wheats gave 942 seeds of which 97 sprouted and formed ears and this number was increased to 276 by vegetative propogation. Of the wheat races with $n = 21$, 11,256 pollinated flowers gave 1,772 hybrid seeds, 1,596 of which sprouted and in this case vegetative propagation gave 12,014 hybrid ears.

T. monococcum and *T. dicoccum* were very difficult to cross with rye and any seeds obtained showed poor germination.

The results with *T. durum* and *T. turgidum* were very similar; out of 18 different native varieties of *T. durum* only 8 produced ears in F_1, while out of 6 native *T. turgidum* varieties only 3 produced ears.

In 1940 the hybrid seeds produced only 2–7 ears each, whereas the 1939 seeds produced from 20–100 ears, vegetative propagation having been favoured by the rainfall that year.

A study of the morphology and biology of the F_1 hybrids and the F_2 and F_3 obtained by back-crossing to rye included observations on seed shape, anthocyanin colouring of the F_1 seedlings, auricles, tillering, stem colour after shooting, time of flowering, length, thickness and pubescence, etc., of culm, lodging, awns, node thickness, length of rachis, number of spikelets and number of florets per spikelet, glumes, etc.

The F_2 and F_3 hybrids showed hardly any winter injury in 1941/42 and were also free from lodging.

The F_2 from the rye back-cross show types between the F_1 and wheat varieties and the question of whether they represent a genuine F_2 is discussed. The chief types found in the F_2 and F_3 are illustrated in numerous figures and certain morphological features distinguishing the various races are mentioned.

In contrast to Tschermak and to Oehler, the author found all ears fertile in the F_2 and F_3. The number of seeds per ear was generally 32–56.

The baking value of F_3 grains was also investigated.

MAIZE 633.15

623. SHAFER, J. (jun.) 633.15:575.125:581.481
The relation of embryo axis weights to heterosis.
Amer. J. Bot. 1944 : **31** : 503–06.

Doubt is thrown on the general applicability of Ashby's theory of heterosis. Using inbred maize material, it was found that the correlations between embryo axis weight (embryo weight excluding the scutellum) and the final dry weight of the grain or the total weight of the embryo were not close. Also, some heterotic plants display no initial advantage in embryo axis weight.

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* A translation of this paper is on file at the Bureau.

624. Fauvel, J. H. 633.15:575.242
Etude sur l'origine du maïs. (**Study on the origin of maize).**
Rev. Hort. Agric. Afrique Nord 1941 : **45** : 77–83.
The existing evidence showing that maize is a mutant from teosinte is presented in semi-popular form.

625. McClintock, B. 633.15:576.356.2:575.11
The relation of homozygous deficiencies to mutations and allelic series in maize.
Genetics 1944 : **29** : 478–502.
Two different phenotypes, pale-yellow seedling (*pyd*) and white seedling (*wd*) have been obtained by the loss of chromatin material from the tip of the short arm of chromosome 9. Seven plants of the former type and six of the latter were obtained, all independently, and each class of phenotypes was shown to be allelic *inter se.* The two classes differ in that the deficiency of the second is slightly longer than that of the first. These two deficiencies behave in heredity like simple Mendelian genes and are allelic with each other and with the normal type. The *pyd* mutant is dominant to *wd* and both are recessive to the normal form. The *wd* plants are allelic and recessive to plants carrying the gene yg_2 which is situated near the end of the short arm of chromosome 9. The *pyd* mutants, however, are not allelic to yg_2 and it is therefore assumed that, in this case, the chromatin deficiency does not extend sufficiently far along the chromosome arm to reach the locus of yg_2.

626. Jones, D. F. 633.15:576.356.2:581.483
Growth changes in maize endosperm associated with the relocation of chromosome parts.
Genetics 1944 : **29** : 420–27.
"Outgrowths of the surface of mature maize seeds are associated with breakage and relocation of chromosome parts.
"Using gene markers of the long arm of chromosome 5 it is shown that somewhere between *Bt* and *Pr* growth activating regions exist which are stimulated to increased growth presumably when brought into close contact with other regions of the chromosomes that are normally kept separate." [Author's summary].

627. Whaley, W. G. and 633.15:581.1:575.125
Long, A. L. 635.64:581.1:575.125
The behavior of excised roots of heterotic hybrids and their inbred parents in culture.
Bull. Torrey Bot. Cl. 1944 : **71** : 267–75.
Excised roots of tomato and maize were grown in samples of Pfeffer's solution containing respectively thiamine, thiamine and pyridoxine, and thiamine, pyridoxine and nicotinamide. It is suggested that the observed heterosis was due to a more efficient matabolism which gave the hybrid roots greater ability to synthesize or utilize certain essential substances.

628. Phinney, B. O. 633.15:581.45:575.113
Gene action in the development of the leaf in *Zea mays.*
Amer. J. Bot. 1944 : **31** : No. 8 : p. 4s. (Abst.).
An analysis of the mode of action of gene dwarf-1 in controlling leaf development is presented. The shorter leaf length of plants carrying this gene is due to a slower rate of cell division and cell enlargement and a delay in the inception of maturity.

629. Harvey, P. H. 633.15:581.48:575.1
The occurrence of deficient kernels in southern corn varieties.
J. Elisha Mitchell Sci. Soc. 1940 : **56** : p. 223.
"Large numbers of self-pollinated ears have been produced in southern corn varieties by the N.C. Agricultural Experiment Station. Those ears which were visibly segregating for deficient kernels were counted in twenty varieties. The average percentage of segregating ears (6·16%) in ten yellow (endosperm) varieties was significantly lower than the average (8·80%) in the white (endosperm) varieties. The percentage of segregating ears varied from zero to 20·0 per cent in the different varieties. Variations in percentage of segregating ears between varieties were significent in the yellow varieties but were not significant in the white varieties".

BARLEY 633.16

630. GRANHALL, I. 633.16:575(48.5)
Svalöfs Ymerkorn (Sv 40/13 b_1). [**Svalöfs Ymer barley (Sv 40/13 b_1)**].
Sverig. Utsädesfören. Tidskr. 1944 : **54** : 237–39.

A detailed account is given of this new very high yielding, stiff-strawed, malting barley for southern and central Sweden. This line, with Sv 40/15 b_1, was derived from Maja x Sv 34/22 and is to be put on the market in spring 1945.

631. ROSENDAHL, G. 633.16:576.356.5
Cytologische Untersuchungen an tetraploiden Gersten. (**Cytological investigations on tetraploid barleys**).
Kühn-Archiv 1943/44 : **60** : 238–52.

Progenies of tetraploid barleys obtained by heat shock in 1938 were cytologically analysed to ascertain how far the degree of sterility was connected with the course of meiosis.
Hybrids with $2n$ chromosomes showed 7 bivalents at metaphase I, whereas in the $4n$ hybrids, in addition to bivalents, which predominated, associations of four were also found corresponding to Darlington's types 11 (chain), 12 (branched chain), 17 (ring) and 18 (double ring). Darlington's types, 14, 15 and 16 were found occasionally but types 13, 19 and 20 never. Trivalents were discovered (in contrast to Peto's findings), and also unpaired chromosomes. Darlington's types 7, 8 and 9 also occurred, but not type 10. Associations of 5 and 6 were very rare and in general multivalents were not numerous.
From a detailed study of the F_2, it is concluded that, apart from the anomalous type which forms hexavalents, the various crosses showed no marked differences in number of univalents, bivalents, trivalents and quadrivalents formed. In general, the tendency to form multivalents was not very marked in the material here used.
In the F_3, an aneuploid with $2n = 24$ chromosomes was found which developed normally and produced fertile ears. One other aneuploid with $2n = 30$ was also fertile.
As regards fertility, it was observed that the progeny of highly pollen-sterile F_2 plants showed normal reduction divisions.

632. LITZENBERGER, S. C. 633.16:581.46:575.12(78.6)
Compana and Glacier barley.
Bull. Mont. Agric. Exp. Sta. 1944 : No. 422 : Pp. 18.

Two new barley varieties are described. Compana, an F_{10} selection from Composite Cross C.I.4116, is a two-rowed semi-smooth-awned early variety which yields well on non-irrigated land. Glacier, an F_5 selection of Atlas x Vaughn, is a six-rowed semi-smooth-awned early variety; it yields well and is resistant to lodging.

MILLETS AND SORGHUM 633.17

633. YU, T. F. 633.171–2.451.2–1.521.6(51)
Inheritance of kernel smut resistance in millet crosses.
Science Rec., Chungking 1942 : **1** : Nos 1 and 2 : 248–50.

A study has been made of kernel smut resistance (*Ustilago Crameri* Körn.) and seed coat colour in the parents and progenies of five millet crosses. Results showed that resistance was dominant and due to a single factor difference in the cross of the resistant strain N2 with the susceptible strain N65. In the same cross there was no linkage between colour of seed coat and reaction to smut. The mode of inheritance of smut resistance in the other four crosses appeared to be more complex. The results will be reported later.

634. PRICE, C. A. 633.174:575.12(76.4)
The merits of Bonita.
Sth. Seedsman 1944 : **7** : No. 11 : 16, 19.

This newly developed variety of grain sorghum, which originated as a selection from a cross of hegari and Chiltex, has out-yielded other varieties by 5–8 bushels per acre. The tillers of Bonita spring directly from the seed, thus uniformity of plant height and maturity of heads is ensured. Livestock appears to prefer Bonita stalks to those of some other varieties.

RICE 633.18

635. JODON, N. E. 633.18:575.11
The inheritance of flower fragrance and other characters in rice.
J. Amer. Soc. Agron. 1944 : **36** : 844–48.

The flower fragrance of the Philippine variety C.I.3794 appears to be inherited as a single

dominant character, not linked to pubescence, straw colour, resistance to *Cercospora*, outer glume colour, inner glume colour or maturation time. These last-named characters are also independent of one another and various factorial schemes to account for their segregation behaviour are discussed.

636. Burgos, J. J. 633.18:575.11.061.6:061
La distribución de los pigmentos antociánicos en el arroz y su comportamiento hereditario. (**The distribution of the anthocyanin pigments in rice and their hereditary behaviour**).
Rev. Fac. Agron. 1943 : **25** : 175–214.

The different types of anthocyanin pigmentation found in rice are described. A collection of 125 varieties was classified according to pigmentation; 80 varieties were altogether without anthocyanin, the rest are described in respect of the distribution and type of their pigmentation. Finally the existing information with regard to the inheritance of pigmentation in rice is reviewed by reference to the literature.

OTHER CEREALS 633.19

637. Cárdenas, M. 633.19(84)
Descripción preliminar de las variedades de *Chenopodium quinoa* de Bolivia. (**Preliminary description of the Bolivian varieties of *Chenopodium quinoa***).
Rev. Agric. Bolivia 1944 : **2** : No. 2 : 13–26.

The author classified the Bolivian types of *Ch. Quinoa* into three varieties, comprising some 20 forms. In addition to the botanical descriptions, notes are also given on disease resistance and other economic characters. J. G. H.

FORAGE GRASSES 633.2

638. Tiemann, A. 633.2/3–1.531.12
Zwanzig Jahre im Dienst des Futtersamenbaues und der Zucht von Futterpflanzen. (**Twenty years in the service of seed production of fodder plants and the breeding of fodder plants**).
Kühn-Archiv 1943/44 : **60** : 337–46.

Brief notes are presented on the work at the Kraftborn Institute for Grassland Management in Breslau (Institut für Grünlandwirtschaft), on the following crops: *Festuca pratensis, Agrostis intermedia, Lolium perenne, Bromus inermis, Agropyron cristatum, Trifolium pratense* and *T. incarnatum, Melilotus* and *Medicago media.*
The importance is stressed of ensuring that improved types are not defective in seed production.

639. Saez, F. A. and
Núñez, O. 633.282:575.127.2:576.356.5
La citología de *Sorghum almum* Parodi nueva especie con 40 cromosomas. I. Los cromosomas somáticos. (**The cytology of *Sorghum almum* Parodi, a new species with 40 chromosomes. I. The somatic chromosomes**).
Notas Mus. La Plata 1943 : **8** : 333–48.

The diploid number of chromosomes for *S. almum* has been determined as $2n = 40$. From a study of the morphology of the chromosomes the authors have reached the conclusion that this species has arisen through the union of a normal gamete of *S. halepense* with a diploid gamete of a species from the subsection Arundinacea. J. G. H.

640. 633.283:576.312.35
Nielsen, E. L. 633.283:575.22
Analysis of variation in *Panicum virgatum*.
J. Agric. Res. 1944 : **69** : 327–53.

A statistical analysis of the intraspecific variation of *P. virgatum* L. is presented. The following chromosome numbers occur but are not segregated into regional races: $2n = 18, 36, 54, 72, 90$ and 108. Fifteen quantitative morphological characters were analysed and their inter-relations studied by the methods of linear regression and frequency distribution.

641. BURTON, G. W. 633.283:576.312.35:581.162.5:575.127.2
Hybrids between Napier grass and cattail millet.
J. Hered. 1944 : **35** : 227–32.
A description is given of the F_1 hybrid progenies of *Pennisetum purpureum* Schumach ($2n = 28$) x *P. glaucum* (L.) R.B. ($2n = 14$). A number of low-yielding chlorophyll deficient plants were found but the normal green offspring tended to out-yield *P. purpureum*. The hybrids are sterile although a few back-cross progenies were obtained. There are 21 diploid chromosomes in the hybrids, the components derived from each parent being distinguishable on account of their size.

642. OLMSTED, C. E. 633.287:581.143.26.035.1
Growth and development in range grasses. IV. Photoperiodic responses in twelve geographic strains of side-oats grama.
Bot. Gaz. 1944 : **106** : 46–74.
Wide variation in respect of photoperiodic response has been established for the grass *Bouteloua curtipendula* (Michx) Torr. This differential response is manifested in the morphological characters of the strains.

643. PARODI, L. R. 633.288:582(82)
Gramíneas austroamericanas nuevas o críticas. II. (**New or critical South American Gramineae. II**).
Notas Mus. La Plata 1943 : **8** : 75–100.
Erianthecium, a new genus of fescues from Uruguay, is described. New or critical species from several other genera of South American grasses are also given systematic treatment. J. G. H.

644. PARODI, L. R. 633.289(82)
Los bambúes cultivados en la Argentina (**The bamboos cultivated in Argentina**).
Rev. Argent. Agron. 1943 : **10** : 89–110.
Eleven species of bamboo, cultivated in Argentina and originally from the far east, are described and figured. The author stresses the possible economic importance of seven of the species, the others being of ornamental value only. J. G. H.

LEGUMINOUS FORAGE PLANTS 633.3

645. TYSDAL, H. M. 633.31:575
1942 Report of the Uniform Advanced Alfalfa Nurseries.
U.S. Dep. Agric., Agric. Res. Admin. Bur. Pl. Ind., Soils, Agric. Engng, Div. For. Crops and Diseases, Washington 1943 : Pp. 17. (Mimeographed).
Three new varieties have been named, Atlantic (A-145), Buffalo (A-11) and Ranger (A-136). The one serious deficiency of Atlantic is its susceptibility to bacterial wilt disease, though in field tests it has shown considerable tolerance. Buffalo has more resistance to bacterial wilt than Hardistan, and is as resistant to leaf and stem disease as Kansas Common. In seed production and forage yields Buffalo is as high as Kansas Common. The outstanding characteristic of Ranger is its resistance to bacterial wilt. In seed production it is superior to Hardistan, in forage production intermediate between Grimm and Hardistan. It is slightly more susceptible to leaf spot diseases and leaf hopper yellowing than Grimm but not as susceptible as Hardistan.

646. WESTOVER, H. L. 633.31:575
Report of the Ninth Alfalfa Improvement Conference November 12, 1942 St. Louis, Missouri Pp. 19. (Mimeographed).
This report includes a description of the new variety A-136, now named Ranger by the Nebraska Agricultural Experiment Station, and released for commercial distribution. Its desirable qualities are strong resistance to wilt and cold, quick recovery after cutting, very slight autumnal dormancy, and less lodging than Hardigan, Grimm, Cossack and Common. It yellows more rapidly under adverse conditions than these varieties.
A further new variety A-147 is described, a composite of A-8 and A-11 selections from an old line of Kansas Common. A-147 is more resistant to bacterial wilt than Kansas Common, and is as resistant as Kansas Common to leaf and stem disease. In the area to which it is adapted A-147 is as high in seed production and forage yield as Kansas Common.

647. 633.31–2.6–1.521.6:575

1943 report of the Uniform Alfalfa Nurseries.
Agric. Res. Admin., Bur. Pl. Ind., Soils, Agric. Engng, Div. For. Crops Dis., U.S. Dep. Agric. 1944 : Pp. 20. (Mimeographed).

A new variety has been maned Nemastana. In tests in Utah and Nevada under the number F.C. 19304, its outstanding merit has been its survival in nematode infested soil. It is also somewhat resistant to bacterial wilt. The variety is only considered useful as a stop-gap for cultivation in the western States.

648. Mostovoj, K. 633.32:581.162.5:581.45:575

(Virescence of the flowers as a cause of plant sterility).
Ann. Tschech. Akad. Landw. 1940 : **15** : 142–46.
[From Z. Pflanzenz. 1943 : **25** : 459–60].

The literature on the genetic and teratological aspects of the subject is reviewed as an introduction to the writer's observations on red and white clover. The effects of short day, humidity, drought, etc., on the occurrence of virescence are discussed. Normal plants can be fertilized by pollen of partially green flowers, whose progeny then show varying degrees of virescence. Virescence should be eliminated in selection, as it greatly reduces seed production.

649. Atwood, S. S. 633.322:581.162.5:575.113.3

Oppositional alleles in natural populations of *Trifolium repens*.
Genetics 1944 : **29** : 428–35.

The occurrence of oppositional alleles determining incompatibility has been investigated in two natural populations of *T. repens*. Of 98 plants sampled, all were self-incompatible and all cross-compatible with a plant homozygous for S_1. Inter-crossing the F_1 progenies of the above crosses revealed 1·53% and 0·94% incompatible crossings for each population respectively, the proportion of different alleles in the two cases being 73% and 80%.
A case of male sterility is also described which is not due to morphological abnormalities.

650. Garver, S.,
Slatensek, J. M. and
Kiesselbach, T. A. 633.366(78.2)

Sweetclover in Nebraska.
Bull. Neb. Agric. Exp. Sta. 1943 : No. 352 : Pp. 47.

Descriptions are given of the varieties of sweet clover grown in Nebraska.

651. Friend, W. H. 633.366:575.12(76.4)

Goin' places .. with Emerald.
Sth. Seedsman 1944 : **7** : No 9 : p. 12.

Manke, K. F. and
Friend, W. H.
Texas "progress report" on Emerald sweetclover.
Ibid. 1944 : **7** : No. 9 : 12, 52.

The new sweet clover Emerald was developed from a cross between Huban and a many-stemmed, leafy, green-seeded biennial white-flowering selection. It is a superior forage variety characterized by its many fine stems, leafiness and green seeds.

ROOTS AND TUBERS 633.4

652. Edmundson, W. C.,
Schaal, L. A. and
Binkley, A. M. 633.491:575.12

Pawnee potato is new variety 'tailored' for northern Colorado growing conditions.
Colo Fm Bull. 1943 : **5** : No. 2 : 13–15.

The new variety Pawnee, derived from Rural New Yorker No. 2 x Katahdin, produces high quality tubers and is adapted to the conditions of northern Colorado. Vine growth is comparatively slight, a factor of importance when spraying for flea beetle control.

653. CALDWELL, J. S.,
LOMBARD, P. M. and
CULPEPPER, C. W. 633.491:581.6(73)
Variety and place of production as factors in determining suitability for dehydration in white potatoes.
Canner 1943 : **97** : No. 3 : 30, 32, 34–35, 42, 44; No. 4 : 14–17, 24; No. 5 : 15–16, 18–19, 28.

The work here reported had two purposes, viz. (1) the securing of information as to the comparative suitability for dehydration of the important and widely grown varieties of white potatoes, and (2) the determination of the extent of the variation in quality of the product from a variety as grown in the different areas in which it is produced commercially.

Data obtained included specific gravity of fresh potatoes, percentages of peeling and trimming loss, dry yield as percentage of fresh stock and of prepared strips, and amounts of water absorbed in "refreshing" and cooking. Other factors considered were colour and general attractiveness of the dry product, and colour, texture or consistency, palatability and flavour of the material as "refreshed" and cooked as riced potato.

None of the material, regardless of variety or place of growth, was unacceptable as food, and all samples were graded favourably.

No particular district showed any consistent or general superiority to the others in quality of product, while in each of the districts supplying a number of varieties, the different varieties differed widely in rank. No single variety showed any outstanding superiority to the others in quality of product. All the varieties used in the experiment are potentially capable of producing material of high quality provided that they are grown under the conditions to which they are well adapted.

654. CALDWELL, J. S.,
CULPEPPER, C. W. and
LOMBARD, P. M. 633.491:581.6(73)
Suitability for dehydration in white potatoes as determined by the factors of variety and place of production. I.
Amer. Potato J. 1944 : **21** : 211–16.

CALDWELL, J. S.,
CULPEPPER, C. W. and
STEVENSON, F. J.
Suitability for dehydration in white potatoes as determined by the factors of variety, place of production, and stage of maturity. II.
Ibid. 1944 : **21** : 217–29.

A detailed account is given of varietal differences of potatoes in respect of dehydration quality.

655. CÁRDENAS, M. 633.491:582(84)
Enumeración de las papas silvestres de Bolivia. Descripción de dos especies nuevas de Cochabamba. (**List of the wild potatoes of Bolivia. Description of two new species from Cochabamba**).
Rev. Agric. Bolivia 1944 : **2** : No. 2 : 27–36.

Notes and short descriptions are given of the Bolivian wild potato species. Two new species, *Solanum pinnatifidum* and *S. capsicibaccatum*, are described and figured. J. G. H.

656. SCHAAL, L. A. 633.491–2.3:576.16:631.521.6
Variation and physiologic specialization in the common scab fungus (*Actinomyces scabies*).
J. Agric. Res. 1943 : **69** : 169–86.

Strains of *A. scabies* have been distinguished which differ *inter se* in mycelial colour, type of pigment produced on cultural media, and pathogenicity to potato varieties. No correlation was discovered between pathogenicity and cultural characters. Several strains sectored frequently in culture, the new strains sometimes having different pathogenic reactions to the parent strains.

657. HARTMAN, R. E. and
AKELEY, R. V. 633.491–2.412.5–1.521.6:575.114(73)
Potato wart in America.
Amer. Potato J., 1944 : **21** : 283–88.

The varietal resistance of American potatoes to wart disease (*Synchytrium endobioticum*) has been investigated. All the highly resistant and immune varieties, excepting Mesaba, have Katahdin as their male parent. Segregation for resistance has been observed in seedling progenies.

658. FEISTRITZER, W. 633.491–2.8–1.521.6:575
Möglichkeiten einer systematischen Resistenzzüchtung gegen die Abbaukrankheiten der Kartoffel. (**Possibility of systematic breeding for resistance to degeneration diseases of the potato**).
Kühn-Archiv 1943/44 : **60** : 347–57

A detailed description is given of the difficulties of breeding potatoes resistant to leaf roll, A, X and Y mosaic, and to mixed infections. In dealing with large numbers of new strains of potatoes, testing in the field is essential. The choice of sites and the laying out of the experimental plots are fully discussed.

Experiments on the lines indicated have been carried out with progenies of crosses within *Solanum tuberosum*. During 1935–39 the progenies of 355 crosses were tested. Among the new seedlings raised in 1935–37, comprising 48,557 plants, only two new strains, numbers 387/37 and 811/37, were found that were more resistant than the resistant control varieties belonging to the same seasonal group. These two were not only resistant, but also exhibited good yielding capacity, flavour, tuber shape and distribution and were also wart resistant.

The suitability of various regions of Germany for such trials is compared.

Since complete immunity to the severe degeneration diseases has not yet been found, practical breeding must for the present aim at improving partial resistance, i.e. discovering and producing types with a resistance superior to that of the most resistant existing varieties. The technique outlined provides for such work with varieties of all seasonal groups.

The value of crosses of *S. tuberosum* varieties was further supported by trials in 1938 and 1939, when other strains, derived from crosses of varieties whose resistance is recognized by growers, were found to include not only strains equalling the parents in resistance but also types surpassing them, e.g. strains 1529/38, 3758/39 and 2794/39. Various features of these three strains suggest a rather close relationship between the parent varieties. On the other hand, it must be remembered that absence of disease in some instances merely implies a resistance just high enough to ensure an internal inhibition sufficient to prevent the disease from breaking out.

In general the number of resistant progeny from a cross is higher when both parents are highly resistant than when one is very susceptible.

The difficult problem of combining increased resistance with good table quality is considered, with due reference to the large number of factors that must be present together to ensure a combination of these two qualities in high degree in a new strain. Three promising combinations for the breeder are mentioned, with some data on the performance of one of the crosses demonstrating the successful combination of good quality with high resistance.

FIBRES 633.5

659. MORGENROTH, E. 633.51:575(47)
Die geschichtliche Entwicklung und Fortschritte der Kultur und Züchtung der Baumwolle in Russland. (**Historical development and progress of the cultivation and breeding of cotton in Russia**).
Kühn-Archiv 1943/44 : **60** : 315–36.

This is an historical study, based on Russian sources.

660. RAMOS, I. and
MORAIS, M. V. DE 633.51:575(81)
O comportamento de linhagens de algodão Delfos e Stoneville em Ribeirão Preto. (**The behaviour of lines of Delfos and Stoneville cotton in Ribeirão Preto**).
Bragantia, S. Paulo 1943 : **3** : 553–95.

Lines of various cottons selected by S. C. Harland have been tested in a number of localities in the state of São Paulo. The average four year yield of the Delfos and Stoneville selections was 18·3% higher than that of the standard variety, the actual differences varying between 13·8% and 28·9%. The variations in yield from one year to another were very great and the various causes responsible for this are discussed. The annual variations were somewhat less pronounced in most of the Delfos selections than in the control variety and some selections varied less than others; several selections exceeded the control in four successive years, the best being line 38/1418. The Stoneville selections, though yielding somewhat less than the Delfos selections, were also well above the standard in average yield and their annual fluctuations were also less; line 38/1709 yielded more than the standard in all years but one and had an unusually high lint percentage.

661. HARLAND, S. C. 633.51:575(85)
The selection experiment with Peruvian Tangüis cotton.
Bull. Inst. Cott. Genet., Lima, Peru 1944 : No. 1 : Pp. 98.

The Tangüis variety, predominant in Peru, originated from a single plant of *Gossypium barbadense* found in a crop of *G. hirsutum*. In the author's opinion, this plant was a relic of the indigenous *G. barbadense* variety Semi-aspero, remnants of which survived as an impurity in *G. hirsutum* for many years, and were modified by natural selection in the direction of early maturity. Tangüis was originally resistant to *Verticillium* wilt and was very high-yielding. The lint was long, coarse and white, and the ginning percentage very high. In the course of its spread through Peru, the variety became very mixed and breeding work to establish a superior type was started in 1940. The methods used are reported in detail.

Pure line selection was not adopted, the author giving reasons to show that the extra uniformity obtainable by this method would not be an advantage in a relatively coarse cotton. In his opinion, most pure-line breeding has been on far too small a scale to be effective, and it has resulted in the loss of valuable genes and the retention of undesirable ones.

The initial material for breeding consisted of 22,000 single-boll samples. These were reduced to 2863 by eliminating those with lint less than $1\frac{1}{4}$ in. long or of bad colour. A single row of 11 plants was raised from each boll in 1940–1, rows which fall below fixed standards for lint length, boll weight, ginning percentage or yield being rejected. Subsequent rejection of rows with bad lint colour reduced their number to 41, from which 200 plants were selected. Seed from these was sown in a replicated trial.

In 1942, correlation studies showed that selection for lint length, boll weight, ginning percentage and yield had been effective even on single rows of 11 plants. A considerable all-round improvement was obtained in the variety. The 200 strains under trial were reduced to 43 on the basis of the above four characters and also on fineness and colour of lint, individual strains failing to come up to a set standard in any one of the six characters being rejected. These 43 strains formed the basis of the first two commercial multiplications of seed distributed by the Institute. For further breeding, the best 10 strains were taken, 10 plants from each, the selection being on much the same lines as previously. Of the 100 plants so tested, 63 were retained for bulk multiplication. It is intended to continue breeding in this way, so that successive distributions of seed will displace older types, and deterioration through admixture or crossing will be minimized. A study was made of the errors involved in estimating lint length by a commercial grading method and by the measurement of halo length on combed seeds.

In an appendix some genetical data are given. In crosses with Sea Island, Tangüis is shown to carry dominant genes for hairiness (H^{TA}), yellow corolla (Y) and yellow pollen (P). S.E.

662. DORMAN, C. 633.51:575.14
A year of research in Mississippi farm problems. Cotton investigation: breeding, genetics, varieties.
Miss. Fm Res. 1942 : **5** : No. 10 : 3–4.

Studies at Stoneville Station have demonstrated that the efficiency of selection within many varieties of cotton can be increased by preceding the selection by three to five years of inbreeding.

663. 633.51:581.162.3
VANSELL, G. H. 634.31:581.162.3
Cotton nectar in relation to bee activity and honey production.
J. Econ. Ent. 1944 : **37** : 528–30.

VANSELL, G. H.
Some western nectars and their corresponding honeys.
Ibid. 1944 : **37** : 530–33.

Varietal differences in the quantity and composition of nectar in cotton and oranges are indicated. It is believed that such differences influence the activity of visiting bees.

664. NOVIKOV, V. A. 633.51–1.813–1.521.6(47)
(Investigations on the salt resistance of cotton).
Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1943 : No. 6 : 307–31.

Cotton plants belonging to several varieties were grown in soils of different degrees of salinity. The physiological and other reactions of the plants were observed. The yield and general condition of the plants deteriorated as the salinity of the soil increased, but the plants acquired succulent characters and showed a certain capacity to adapt themselves. During the germinating

stage they were least immune to the ill-effects of salinity; therefore breeders who seek to adapt cotton to saline soil must produce varieties which can withstand salinity at this particular stage of growth; higher degrees of salinity can be tolerated as the plants grow; those which withstand it best when seedlings withstand it best when fully grown.
The following varieties proved to be capable of surviving high degrees of salinity: *Gossypium barbadense* No. 670, the germination of which was 74% at 0·4 normal salinity; and the local Asiatic (*G. herbaceum*) and Indian (*G. neglectum*) cottons. These may be of use for hybridization. Only 7 of the 37 American cottons (*G. hirsutum*) were found to withstand salinity up to 0·4 normal.

665. Pasković, F. 633.522:581.6(49.7)
Tehnološka ispitivanja naših važnijih sorata konoplje. (**Technological investigation of our main hemp varieties**).
Arhiv Minist. Poljopr. 1940 : **7** : No. 18 : 89–110.

The various methods of estimating fibre content and quality in hemp are described. Single stems of two lots of 1200 plants each were subjected to retting and the results are presented in tabular form. The male plants almost invariably gave a higher total and percentage yield of fibre than the female; the difference varied from 3·5 to 6%; in spite of this the actual weight of the male plants was often less than that of the females. Since the yield of plants per hectare from the female plants is greater than that from the males however, the total yield of fibre per hectare is also greater from the females.
The lowest yield of stem per hectare was given by the variety Potočec, which consequently gave the lowest yield of fibre per hectare. Differences between other varieties were small and not statistically significant, though the variety Bologna was the highest. The variety Bologna produced the strongest yarn in 1935, and the variety Belje in 1936; all varieties showed great annual fluctuations in this character and no definitive conclusions could be reached; the average of the two years however showed a slight difference in favour of Bologna. In all cases, except Bologna hemp in 1935, the yarn from male plants was stronger than the yarn from female plants of the same variety. The male plants were almost invariably relatively thinner than the female but they seemed to give a stronger yarn even when they were thicker. No varietal differences were observed in elasticity of the fibre.

666. Crane, J. C. 633.524.35:575.11
Kenaf (*Hibiscus cannabinus* L.) as a fiber crop.
Off. For. Agric. Relations, U.S. Dep. Agric., Div. Latin Amer. Agric. 1943 : Pp. 39. (Mimeographed).

This publication includes a description of the varieties of *Hibiscus cannabinus* L., and of its cytogenetic problems.

SUGAR PLANTS 633.6

667. Solano, J. A. 633.61(85)
Las nuevas variedades de caña de azúcar en el ingenio. (**The new sugar cane varieties in the factory**).
Vida. Agr. 1942 : **19** : 873–91.

Observations have been made on the behaviour in Peruvian sugar factories of the varieties POJ 2878, POJ 2714, POJ 36M, BH 10/12, Uba and Demerara 95. It is concluded that the improved yield of cane and of bagasse and the greater efficiency in the factory more than outweigh any slight defect they may have in respect of difficulties in clarification of the juice. Measures for overcoming their difficulties are suggested.

668. Beauchamp, C. E. 633.61–2.112–1.521.6(72.91)
Effects of drought on the cane yield.
Proc. 17th Annu. Mtg Asoc. Técn. Azucareros Cuba 1943 : 13–28.

This article includes a section on the varietal resistance of Cuban sugar canes to drought.

669. Pázler, J. 633.63:575(43.7)
Richtlinien und Aufgaben der heimischen Zuckerrübenzucht. (**Directions and tasks of home sugar beet growing**).
Z. Zuckerindustr. Čsl. Repub. 1941 : **65** : 51–59.
[From Z. Pflanzenz. 1943 : **25** : 464–65].

Sugar beet breeding since 1933 in Bohemia and Moravia is reviewed with figures for 1934–38,

showing the root and sugar yields of the most important varieties, classed according to the types E, N, Z, etc., introduced in 1933.
Future prospects in the above regions and the requirements in developing sugar beet breeding on a larger scale are outlined.

670. 633.63:575(43.91)
HIDEGHÉTI BITTERA, N. VON 633.63:581.143.26
Der Zuckerrübenbau in Ungarn. (**Sugar beet cultivation in Hungary**).
Zuckerrübenbau **1942** : **24** : 130–36.

Apropos of the importance of the choice of variety to the Hungarian farmer, the opposition is mentioned that was encountered in efforts extending over the past 50 years to breed high grade varieties from indigenous Hungarian material.
Conditions in Hungary do not favour bolting which makes the breeding of resistant types more difficult than in Germany.

671. NOELDECHEN. 633.63:581.02:581.6(43)
Standweite und Sortentyp. (**Width of spacing and variety type**).
Zuckerrübenbau **1944** : **26** : 3–9.

A discussion is presented on the effects of spacing and variety class (E,N, Z or W) on the yield and sugar content of sugar beets.

672. NOELDECHEN. 633.63:581.02:581.6(43)
Standweite und Sortentyp. (**Width of spacing and variety type**).
Kühn-Archiv **1943/44** : **60** : 178–88.

The substance of this paper has already been abstracted from another source (cf. Abst. 671).

673. 633.63–2.484–1.521.6:575.12
COONS, G. H. 633.63–2.8–1.521.6:575.12
U.S. sugar beet seed meets war crisis.
Sugar **1943** (January—February) 1–6, 7–13.

This review of sugar beet breeding and seed production in the U.S.A. refers to the recently introduced varieties U.S.205 x 215 and U.S. 215 x 216 which both carry some resistance to curly top and leaf-spot.

674. GASKILL, J. O. 633.63–2.484–1.521.6:575.12(73)
Sugar-beet leaf spot is being controlled through breeding of resistant varieties.
Colo Fm Bull. **1943** : **5** : No. 5 : 10–13.

Two single crosses of sugar beet, U.S. 200 x U.S. 215 and U.S. 215 x U.S. 216, have been released. Both are resistant to *Cercospora beticola*. The method used in their production entails the inbreeding of resistant lines followed by planting a mixture of the two parents in the seed field. Since, however, pollination can occur both within and between the two lines, the hybrid seed includes also the seed of the two parent inbreds. Hybrid U.S. 215 x U.S. 216 yields better than U.S. 200 x U.S. 215 and is expected to replace the latter.

STIMULANTS 633.7

675. DUSSEAU, A. 633.71:575.1(44)
L'Institut expérimental des tabacs de Bergerac. (**The Bergerac Experimental Institute for Tobaccos**).
Rev. Hort., Paris **1943** : **115** : 348–51.

The facilities for research on tobacco available at the above institute on the La Tour estate are described. It has (1) a botanical garden containing specimens of the most common Solanaceae including numerous varieties of *Nicotiana*; and (2) a genetical garden demonstrating Mendel's laws.
Work is being done on the production of constant hybrids by genetic selection and also by induced polyploidy.

676. JAKOVUK, A. S. 633.71:575.12:575.148
(**Intra-varietal crossing in *Nicotiana Tabacum* L.**).
Vsesojuznyĭ Naučno-Issledovateljskiĭ Institut Tabačnoĭ i Mahoročnoĭ Promyšlennosti imeni A.I. Mikojana (VITIM). (All-Union Mikojan Research Institute of the Tobacco and Makhorka Industry) Krasnodar **1941** : No. **143** : 29–37.

Plants from seed obtained by intra-varietal crossing and by selfing were grown in alternate rows

and the plant height, number of leaves and yield of raw product per plant were compared. In the varieties Samsun 57, Tyk-Kulak 92 and Tyk-Kulak 235 there was a slight increase in yield from intra-varietal pollination in 1937, but none in Dubec 10 and Trebizond 1269. In 1938 again there was a slight increase in yield in the varieties Tyk-Kulak 235 and Samsun 57 but not in Trebizond 1269. It is pointed out that Dubec 10 and Trebizond 1269 are new varieties and evidently have not attained the physiological heterogeneity characteristic of the older varieties, which seems to be the cause of the increased yields from intra-varietal crossing. A confirmation of this view was provided by experiments in 1938 where intra-varietal crossing in the varieties American 572 and Tyk-Kulak 92, which have been in cultivation for a great many years, produced a marked increase in earliness, whereas varieties that had been grown for a prolonged period at the Krasnodar station and were therefore genetically more homogeneous showed no such response.

In certain crosses carried out in 1936–37 in the Crimea, differences were observed between reciprocal crosses in the manifestation of heterosis when crossing two plants of the same variety. Improvements were noted in the F_2 of intra-varietal crosses in respect of earliness, yield and quality, although the differences were less pronounced than in the F_1.

The results on the whole show that it is not possible to speak of a general improvement from intra-varietal crossing, since each particular combination of varieties and of plants behaves somewhat differently.

677. 633.71:575.125

*Kosmodemjjanskiĭ, V. N. 633.71:575.113.4

(Transgression in different generations of hybrids of *Nicotiana Tabacum*).

Vsesojuznyĭ Naučno-Issledovateljskiĭ Institut Tabačnoĭ i Mahoročnoĭ Promyšlennosti imeni A.I. Mikojana (VITIM). (All Union Mikojan Research Institute of the Tobacco and Makhorka Industry) Krasnodar 1941 : No. 143 : 3–28.

Observations on a large number of F_1 hybrids between different varieties of *N. Tabacum* showed that transgression was most frequent for some characters such as plant height, and least of all in respect of petiole length. Time of maturity was also not often affected by heterosis. Combinations of different varietal groups gave differing degrees of heterosis, which was most frequent in crosses of Dubec and Basma with the Trebizond group; Sumatra and Havanna with the Trebizond, Samsun, Ungushet and American groups; Ambalema with the Trebizond, Dubec and American groups; and Samsun with the Trebizond and Sumatra groups. In crosses involving Dubec, Basma, Sumatra, Havanna and Ambalema, plant height was most affected by heterosis, and in crosses of Samsun the character most affected was leaf size.

Annual variations were observed in the transgression; heterosis might be absent in some of the characters displaying it previously, or a different set of characters might be affected. A similar variation resulted when the same hybrid was sown under different conditions. The seed from each cross was divided and sown at two different places, one with black soil (at Krasnodar) and the other with much lighter soil (at Abinska). Combination No. 2 was, for example, heterotic for height and leaf size at Krasnodar but for height alone at Abinska, and the number of leaves showed negative heterosis at Krasnodar, whereas at Abinska the many-leaved parent was dominant. On the whole the number of cases of positive transgression was greater at Krasnodar in 1933 than at Abinska. At neither station was positive transgression observed in the number of leaves, while negative transgression was frequent. From the data obtained it would appear that whichever character is most favoured by a particular environment proves dominant, as has been shown already by Lysenko. Heterosis is defined not as a favourable combination of hereditary dominants but as "the result of the development of a dominant condition under the influence of environmental action on a favourable combination of hereditary foundations". Thus the conditions recessive, intermediate, dominant and transgressive are all regarded as links in the same chain, subject to the same governing laws.

One of the crosses of greatest interest from the point of view of the practical breeder was Dubec 44 x Tyk-Kulak 92, from which it is hoped to obtain an aromatic Tyk-Kulak form. This hybrid displayed transgression in the F_1 in height and number and size of leaves, and in the F_5,

* An extended summary of this paper is on file at the Bureau.

family No. 168 still showed transgression for height and number of leaves, although to a lesser degree. The F_1 hybrid, however, from a cross Dubec 44 x Hoja Porada 1266 gave no transgression in the F_1. In this cross marked transgression only appeared in the F_2 of most of the families, and in the F_4 generation the progenies of plants 42, 71 and 82 were no longer segregating and still showed transgression for height and number of leaves. Results show therefore that transgression can be maintained in the later generations in those hybrids containing a favourable hereditary complex, and the absence of transgression in F_1 does not exclude its occurrence in later generations but only means that the requisite environmental conditions were not provided.
Four families from the cross Dubec 44 x Trebizond 1272 were uniform for morphological characters and flavour and maintained their transgression in number of leaves up to the F_6 and F_7 generation. Leaf dimensions were almost invariably intermediate.

678. *Žukov, N. I. 633.71:575.127.2(47)

(Alteration of the nature of plants by means of interspecific hybridization in the genus *Nicotiana*).

Vsesojuznyĭ Naučno-Issledovateljskiĭ Institut Tabačnoĭ i Mahoročnoĭ Promyšlennosti imeni A.I. Mikojana (VITIM). (All Union Mikojan Research Institute of the Tobacco and Makhorka Industry) Krasnodar 1941 : No. 143 : 142–233.

An average set of 3 seeds per capsule was obtained in crosses of *Nicotiana rustica* x *N. glauca*; the germination capacity of the seeds varied according to the variety of *N. rustica* serving as seed parent and from some forms no viable seeds were obtained at all. The hybrid Hmelovka 125 x India 134 when crossed with *N. glauca* produced a smaller number of viable seeds than either of the parent varieties individually. Twelve of the 47 mature hybrids produced proved to be amphihaploids (i.e. having only 1 genome of each species) and 35 were sesquidiploids with 1 *N. rustica* genome + 2 *N. glauca* genomes (24R + 12GG). Meiosis in the pure *N. rustica* was regular. In *N. glauca* the first meiotic division was occasionally omitted, which led to the production of dyads and accounts for the formation of the sesquidiploids.
The 12 amphihaploids all had 36 chromosomes (24R + 12G) and differed from both parental species in their morphology; a number of characters, such as height, were intermediate. The plants behaved as annuals. The usual irregularities were observed at meiosis.
The sesquidiploids with 48 chromosomes (24R + 12GG) were all similar morphologically, in spite of having different *N. rustica* forms as parents. They showed a greater resemblance to *N. glauca* than to *N. rustica*, and were distinguishable from the amphihaploids by the anthocyanin pigmentation in the young leaves, and certain vegetative characters. In height and other vegetative characters they were intermediate between the parent species, and were perennial plants. Meiosis was less irregular than in the amphihaploids. By back-crossing the sesquidiploid with the parent species, various new hybrids have been produced, including an amphidiploid *N. rustica* x *N. glauca* and a polyploid with 1 genome of *N. rustica* and 3 of *N. glauca*.
Sesquidiploids with 60 chromosomes (24RR + 12G) were obtained by crossing the *N. rustica* x *N. glauca* amphidiploid with *N. rustica*. They showed a very clear resemblance to *N. rustica*. Meiosis was irregular but less so than in the other group of sesquidiploids. The sesquidiploids of this group crossed more easily than those of the other group but the percentage seed set was still very low (8.4%). Crosses with *N. glauca* were more difficult than those with *N. rustica*.
One amphidiploid plant with 72 chromosomes (evidently 24RR + 12GG) was obtained by crossing the sesquidiploid with 2 *N. glauca* genomes with *N. rustica*. The amphidiploid was intermediate between the two species in vegetative characters, and it set seed on selfing. Anthocyanin was absent in the amphidiploid, which was perennial; its flowers were larger than those of the amphihaploid or the sesquidiploids. In plants that had 72 chromosomes in the root tips meiosis was regular in 66·9% cases. Certain plants had 68 chromosomes, and regular meiosis in these cases was very rare. The amphidiploid crosses fairly easily with *N. rustica*, but less readily with *N. glauca*.
A progeny of 129 plants was obtained from back-crosses of the sesquidiploid with two *N. glauca* genomes to *N. glauca*. They segregated widely in respect both of external characters and of anabasine and citric acid contents. The hybrids in general resembled *N. glauca*. An examination of the somatic chromosome number of the hybrids showed that 81·5% of them were from gametes with 24 chromosomes. The back-cross hybrids had very irregular meioses and were low in fertility. Most of them formed seeds when crossed with *N. glauca* but not with *N. rustica*.

* An extended summary of this paper is on file at the Bureau.

The back-cross of the same sesquidiploid with *N. rustica* also gave a progeny which segregated widely, forms resembling *N. glauca*, others resembling *N. rustica* and many intermediate types being found. Most of the sesquidiploid gametes contained 24 chromosomes. The sesquidiploid crosses easily with *N. Tabacum*, producing triple hybrids, most of which have a full *N. Tabacum* genome, a full *N. glauca* genome and a few univalents from *N. rustica*.

The chemical composition of the three species is very different, since *N. rustica* contains much more nicotine than *N. Tabacum* and *N. glauca* contains anabasine. All the amphihaploids contained anabasine in place of nicotine, but the quantity was less than in *N. glauca*. The sesquidiploid (24R + 12GG) also contained anabasine, the content being about equal to that in *N. glauca*. The other sesquidiploid (24RR + 12G), however, had a much higher anabasine content than *N. glauca*. In the amphidiploids the average was 6·06*. Crossing the sesquidiploid and amphidiploid back to *N. glauca* reduces the anabasine content more or less to the level of that species. Back-crosses with *N. rustica* had rather higher values. A study was made of the nicotine and anabasine content in 44 plants of the back-cross (*N. rustica* x *N. glauca*) x *N. rustica*.

Back-crossing with *N. rustica* reduces the citric acid content, back-crossing with *N. glauca* increases it. Some of the individual plants examined in the various progenies had a higher content of both anabasine and citric acid, showing that by interspecific crossing it is possible to combine these two valuable qualities.

The amphidiploids, referred to as *N. dirugla*, have been subjected to selection. Several lines with a satisfactory yield and an anabasine content of 8% have been produced.

679. 633.71:575.129

TERNOVSKY, M. F. 633.71–2.8–1.521.6:575.127.2

(Interspecific hybridization in tobacco and Makhorka (*N. rustica*) breeding).

Vsesojuznyĭ Naučno-Issledovateljskiĭ Institut Tabačnoĭ i Mahoročnoĭ Promyšlennosti imeni A.I. Mikojana (VITIM). (All-Union Mikojan Research Institute of the Tobacco and Makhorka Industry). Krasnodar 1941 : No. 143 : 99–125.

The author reviews the results of his previous work on the production of fertile hybrids of *Nicotiana Tabacum* with *N. glutinosa* possessing the combined resistance to mosaic and mildew characteristic of the latter species (cf. *Plant Breeding Abstracts*, Vol. XIV, Abst. 819). The fertile hybrids of *N. glutinosa* x Dubec have proved practically constant for complex immunity over a number of generations. *N. digluta* x Dubec hybrids also remained free from both mildew and mosaic but segregated both for immunity and fertility in the second generation; the proportion of immune segregates varied from 44 to 69·6% and in the back-cross from 22 to 37%. The F_3 contained no single family that was constant for necrotic reaction; some families segregated into 3 necrotic : 1 susceptible, the proportion of such families varying from 6 to 16% according to which amphidiploid served as the original parent. The proportions were higher in the back-cross. The chromosome number in the families with regular segregation varied from 48 to 51 but meiosis was generally regular. Segregation for necrosis was non-Mendelian in most of the F_3 families and the proportion of immunes varied from 12–14% to 95–98% in different families; a few families with monohybrid segregation were however found, and these produced a certain number of constant immune families in the succeeding generations. Immune lines similar in every other respect to the Dubec 44/39 parent have been obtained and have remained constant in all important respects up to F_8. Hybrids constant for immunity to mildew have now also been obtained. Tests of the flavour of cigarettes made from mosaic immune plants showed them to be in no way inferior in quality to those made from 58 plants of the standard Dubec 44. Some of the hybrids excelled the standard in flavour and aroma. The Dubec aroma is transmitted by the hybrids even in crosses with non-aromatic forms, for instance Tyk-Kulak and Trebizond types. High quality lines constant for immunity to mosaic and segregating for immunity to mildew have been obtained too.

N. digluta was less vigorous in growth than the *N. Tabacum* parent and many dwarf and sterile plants appeared in its progeny when crossed with Dubec. In the succeeding generations, however, by rigid selection, forms were obtained which not only equalled Dubec in yield but in some of them surpassed it. Three of the mosaic immune selections exceeded Dubec by 14–19%

* 6.61% in text. [Abstractor's Note.]

in yield and two of them excelled it also in flavour. Some of the lines still segregating for immunity yield as much as 30–40% more than Dubec 44 and are still high in quality.
By crossing the mosaic immune Dubec hybrids with other standard varieties, immune forms of all the main commercial types have been obtained. These include, Samsun 311 which exceeds the standard Samsun 57 in yielding capacity and is equal to it in quality; American 232 which exceeds the standard American 572 in yield and gives a more aromatic product, being distinguished also by rapid growth; Tyk-Kulak 220, which is equal to Trebizond 92 in yield and superior in aroma; Trebizond 117, which exceeds the standard Trebizond 1272 in yield and quality.
Twenty-five selections which are constant for immunity to both mosaic and mildew are now under observation and have so far proved equal to Dubec 44 both in yield and quality.
Immunity to mildew is found also in *N. tomentosiformis* which crosses easily with *N. Tabacum*; relatively constant forms, distinguished by exceptional vigour of growth, have already been obtained from this cross. *N. glauca* is being used too, on account of its resistance to mottling and thrips and its long incubation period for the mosaic virus; the hybrids, however, behave more irregularly than those with *N. glutinosa*, the sesquidiploids with 2 genomes of *N. Tabacum* and 1 of *N. glauca* being sterile for instance; a further difficulty is that the resistance to mottling is recessive. One promising hybrid, Dubec MTZ, has nevertheless been produced from the cross and has yielded 27% more than Dubec 44 and excelled it materially in flavour.
Original and sometimes very attractive new aromas have appeared among the segregates of some of the interspecific crosses; this is especially true of hybrids with *N. silvestris*. The amphidiploid Dubec x *N. silvestris* is not constant and cannot be used direct but promising forms may be produced by back-crossing it with Dubec. Fam. 1153 of the cross *N. digluta* x *N. silvestris* is outstanding on account of its exceedingly delicate flavour (low nicotine and other nitrogenous compounds), which it retains even when grown in highly nitrogenous soil. Other families promising in the same respect were obtained by pollinating Samsun 57 with pollen of the hybrid *N. silvestris* x *N. tomentosiformis*; some of them were also distinguished by great vigour and immunity to mildew. They are being further crossed with mosaic immune forms to introduce this character too.
Chemical analysis has shown that nicotine is entirely absent in both sterile and amphidiploid hybrids of *N. Tabacum* x *N. glauca* and *N. rustica* x *N. glauca*, its place being taken by anabasine. Anabasine was also dominant when these hybrids were back-crossed with *N. Tabacum* and *N. rustica*. In some hybrids, e.g. *N. dirugla*, the anabasine content was as much as 8%, as compared with 0·86% in the original *N. glauca* parent. Some of the hybrids of *N. ditagla* x *N. Tabacum* in the 5th or 6th generations contain anabasine, although in all other respects they are typical *N. Tabacum* plants. There is evidence to suggest that *N. rustica* plants with still higher anabasine contents, up to 12–15%, can be produced by hybridization.

680. Castetter, E. F. 633.71:576.12:9(78.9)
New evidence on the antiquity of tobacco cultivation in the South-west.
Amer. J. Bot. 1944 : **31** : No. 8 : p. 2s. (Abst.).

A specimen of *Nicotiana rustica* has been discovered at Frijoles Canyon, New Mexico, which on archaeological evidence is assigned to the date 1700 [*sic*].

681. Clausen, R. E. and Cameron, D. R. 633.71:576.356.4:575.116.4
Inheritance in *Nicotiana Tabacum*. XVIII. Monosomic analysis.
Genetics 1944 : **29** : 447–77.

A description is given of the morphological features and hereditary behaviour of the 24 primary monosomics of *N. Tabacum*. Methods of isolating monosomics are described, also their usefulness in locating genes. This is done most simply by crossing double recessive plants to each of the possible dominant monosomics. All these will give F_1 progenies dominant for the gene considered except the monosomic deficient for the relevant chromosome which will give both diploid dominant plants and recessive monosomics.
Using this method, the following genes have been located: *nf*, and *pa* on chromosome A; *Ml*, *Pp* and *yb*, on B; *lf*, *wh* and *wh-P* on C; *co* and *mm* on F; hf_2 and yb_2 on O; *Br*, *pk* and *sg* on *P*; *Pd* on R; *yg* on S; and *ws* on T. The distribution of duplicate genes suggests that segmental cross homology exists between chromosomes A and O, and B and O.

682. GRIFFITH, R. B., VALLEAU, W. D. and JEFFREY, R. N. 633.71:581.174 633.71–2.8–1.521.6
Chlorophyll and carotene content of eighteen tobacco varieties.
Plant Physiol. 1944 : **19** : 689–93.

Significant differences have been found in the content of chlorophyll *a*, chlorophyll *b* and carotene in the leaves of tobacco varieties. No correlation has been found between any of these quantities and mosaic resistance factors.

683. ČERNIČIN, N. G. 633.71:581.48:631.547.6
(Investigation of the stage of maturity of seed plants of *Nicotiana rustica*).
Vsesojuznyĭ Naučno-Issledovateljskiĭ Institut Tabačnoĭ i Mahoročnoĭ Promyšlennosti imeni A.I. Mikojana (VITIM). (All-Union Mikojan Research Institute of the Tobacco and Makhorka Industry) Krasnodar 1941 : No. 143 : 241–47.

Observations on the germination of seed taken from capsules at different stages of ripeness indicated that the best quality seed was obtained in the variety Hmelovka No. 125/c when 50–75% of the capsules in the inflorescence had turned brown, and in the variety Vysokoroslaja Zelenaja [Tall Green] No. 317 when 25–50% had turned brown.

684. RENSKIĬ, M. D. 633.71:581.6:581.44
(Nicotine in the stem of *Nicotiana rustica*).
Vsesojuznyĭ Naučno-Issledovateljskiĭ Institut Tabačnoĭ i Mahoročnoĭ Promyšlennosti imeni A.I. Mikojana (VITIM). (All-Union Mikojan Research Institute of the Tobacco and Makhorka Industry) Krasnodar 1941 : No. 143 : 234–40.

In *N. rustica* about 50% of the product used for smoking consists of stem; yet little or no information exists as to the composition of the stem. Observations made on the 1932 crop showed that the nicotine content of the stem varied from 40 to 96–105% of that found in the leaves. Some varieties were characterized by a high nicotine content in the stem while others had low or variable contents. Slow growing varieties usually had lower total nicotine contents than early maturing varieties.

685. 633.71–1.524:581.6(47)
PSAREVA, E. N. 633.71:575(47)
[System and methods for studying tobacco varieties (collections)].
Vsesojuznyĭ Naučno-Issledovateljskiĭ Institute Tabačnoĭ i Mahoročnoĭ Promyšlennosti imeni A.I. Mikojana (VITIM). (All-Union Mikojan Research Institute of the Tabacco and Makhorka Industry) Krasnodar 1941 : No. 143 : 38–86.
(Instructions for describing, observing and assessing different morphological characters in *Nicotiana Tabacum*).
Ibid. 1941 : No. 143 : 87–98.

The State Research Institute for the Tobacco Industry (VITIM) of the U.S.S.R. has a collection comprising over 5000 varieties of *Nicotiana Tabacum*, *N. rustica* and other species. The majority of the varieties are local forms from different regions of the U.S.S.R. and thus constitute invaluable material for breeding purposes. Valuable characters are also found in some of the imported varieties; e.g. aroma and commercial quality in the Samsun and Basma groups, earliness and drought resistance in the Basma group, and high yielding capacity in the American groups especially Maryland. Promising hybrids have already been derived from the combinations Dubec x Maryland (Dumar), Deli x Samsun 27, Basma Xanti x Dubec Derekoĭskiĭ, and Sumatra x American Devickiĭ. A number of improved varieties have also been obtained by selection from the local strains.

Comments are made on the various systems of classification of tobacco and the various types are described. Testing of the varieties of the different groups is carried out in the respective regions where each group is mainly grown. The methods used in variety testing and the characters on which observations are made are described. These include various biological characters such as vegetation period, phasic development, rate of growth, proportion of leaves to height of stem, resistance to pests and diseases, various properties determining quality and chemical composition, as well as purely morphological features, and yield of leaf and of seeds.

686. SMITH, T. E. 633.71–2.3–1.521.6:575
Investigations of control measures for Granville wilt of tobacco.
J. Elisha Mitchell Sci. Soc. 1942 ; **58** : p. 133. (Abst.).
Experiments were started in 1935 to develop more effective control measures for Granville wilt (*Bacterium Solanacearum* E.F. Smith) of tobacco.
A high degree of genetic resistance was found in a collection of tobacco from Colombia, South America, and progress has been made by hybridization and selection toward the development of resistant varieties of flue-cured tobacco.

687. 633.71–2.8–1.521.6:578.08(47)
TERNOVSKY, M. F. 633.71–2.421.1–1.521.6:578.08(47)
(**Methods for breeding tobacco varieties resistant to tobacco mosaic and powdery mildew**).
Vsesojuznyĭ Naučno-Issledovateljskiĭ Institut Tabačnoĭ i Mahoročnoĭ Promyšlennosti imeni A.I. Mikojana (VITIM). (All-Union Mikojan Research Institute of the Tobacco and Makhorka Industry) Krasnodar 1941 : No. 143 : 126–41.
Only 86 out of 130 plants of Ambalema investigated in 1940 proved resistant to mosaic; the remainder either contained the virus without external symptoms or in some cases actually developed the symptoms. *Nicotiana glutinosa* is immune from mildew (*Erysiphe Cichoracearum* f. *Nicotianae*) and all races of mosaic, and *N. tomentosiformis* is immune from at least the majority of races, and these two species are therefore regarded as more useful parents. The methods of testing for mosaic and mildew resistance are described in detail (cf. Abst. 679).

633.73:575(81)
688. KRUG, C. A. 633.73:576.312
A importância da genética e da citologia para o melhoramento do cafeeiro. (**The importance of genetics and cytology for breeding coffee**).
Bol. Superintend. Serv. Café, São Paulo 1944 : **19** : 746–51.
The extensive coffee breeding scheme initiated in the state of São Paulo in 1933 has included taxonomic, cytological and genetical studies of the genus *Coffea*. By this means it has been established that Murta is a mutant from the variety Bourbon and segregates a quarter of typical Bourbon types in its progeny. Most of the characters of the variety Maragogipe, which is very useful for its tolerance of poor soils, are conditioned by a single gene *Mg*; it is low in yield however on account of its reduced number of flowers per axil and excessive length of internode; it is being crossed with other economic forms in the attempt to combine the merits of both. Lines excelling the common Maragogipe are already under observation.
The recessive yellow seed characteristic of certain varieties has been shown to be not associated with reduced yield; nor is the colour of the young leaf buds conditioned by the gene pair *Br br*.
The production of defective seeds of the concha [shell] type by the fertilization of more than one ovule per locule of the ovary, is a hereditary character and can therefore be selected against. The same holds good for the monospermous "pea-berry" and polyspermous fruits, both of which are associated with reduced yields. The *semperflorens* character is dependent on a single gene and can therefore be transmitted to any character.
Chromosome counts have been made on a number of *Coffea* species and several forms with aberrant chromosome numbers have been found. Fertile interspecific hybrids have been produced by the colchicine technique.
Almost a ton and a half of seed of improved coffee lines were distributed to the growers in 1943.

689. MENDES, A. J. T. 633.73:581.481
Sementes de café poliembriônicas e desprovidas de embrião. (**Polyembryonic seeds and seeds without embryo in coffee**).
Bol. Superintend. Serv. Café, Sao Paulo 1944 : **19** : 618–20.
Observations on a number of mature fruits of the coffee variety Bourbon (*Coffea arabica*) showed that in 8·8% of them more than 1 seed per locule was developed; no analogous occurrence was observed in 480 seeds of *C. excelsa* examined, nor in *C. canephora* or *C. liberica*. True polyembryony was observed in 0·4% of the seeds of *C. canephora* and *C. excelsa* and in up to 7·7% in a *C. arabica* x *C. canephora* hybrid. Seeds without embryo were found only in the variety Bourbon, in 1·2% of the cases examined.
Plants obtained from the polyembryonic seeds are being studied.

690. RAPIN, J. 633.75:575.42:581.6(49·4)
Plantes oléagineuses indigènes. **(Indigenous oil plants).**
Rev. Hort. Suisse 1941 : **14** : 40–43, 49–53.

From the genetic point of view, the stands of cultivated poppies in Switzerland are populations from which more or less productive types can be isolated. Yield, shape of capsules, flower and grain colour, and if possible the oil content are the points on which selection of the oil poppy is based.
Brief instructions are given on how to carry out selection of élites, and the ideal type of plant is described.

AROMATIC PLANTS 633.8

691. 633.821–2–1.521.6:575.12
Report of the Puerto Rico Experiment Station, 1941 (1942) : Pp. 24.

Hybrid seedlings have been produced from reciprocal crosses between *Vanilla Pompona*, a pecies resistant to root rot, and the commercial species *V. fragrans*.

CONDIMENTS 633.84

692. BECKENBACH, J. R. 633.842:575.12(73)
A pendant fruited pepper.
Sth. Seedsman 1944 : **7** : No. 10 : p. 18.

The variety Manatee Wonder is recommended on account of its pendent fruits and resistance to blossom-end rot. It arose in a field of California Wonder, possibly after cross-pollination by a pimento type.

693. MOSTOVOJ, K. 633.842:581.162.5
[**Constitutional sterility in paprika (*C. annuum* L.)**].
Ann. Tschech. Akad. Landw. 1942 : **16** : 308–16.
[From Z. Pflanzenz. 1943 : **25** : p. 460].

Constitutional sterility may be due to sterility of the gynoecium or the androecium, or both. Varieties differ in the occurrence of sterility. Affected plants exhibit pronounced vegetative growth and specially abundant foliage. Such forms should be eliminated to prevent the defect being hereditarily transmitted. Cross-pollination is possible and may be caused by partially defective plants with sound pollen.

OIL PLANTS 633.85

694. CHOPINET, R. 633.853.49:575.127.5:635.15:576.354.4
Hybrides intergénériques *"Raphano-Brassica"*. **(Intergeneric "*Raphano-Brassica*" hybrids).**
Rev. Hort., Paris 1944 : **116** : 98–100.

A general account is given of work on intergeneric hybridization, especially between the genera *Raphanus* and *Brassica*. The author has effected a cross between tetraploid radish and diploid colza and a morphological and cytological description is given of the resulting hybrid.

695. LANGHAM, D. G. 633.853.74:575.113.4
The inheritance of glands in sesame (*Sesamum indicum* L.).
Amer. J. Bot. 1944 : **31** : No. 8 : p. 10s. (Abst.).

The inheritance of gland patterns on the foliage of *S. indicum* L. appears to be determined by multiple factors. Absence of glands from the dorsal leaf surface is associated with bicarpellory fruits.

696. LANGHAM, D. G. 633.853.74:575.12:578.08
Sesame breeding in Venezuela.
Amer. J. Bot. 1944 : **31** : No. 8 : 10s–11s. (Abst.).

Artificial intervarietal hybridization of sesame may be accomplished with the aid of gelatine capsules (cf. *Plant Breeding Abstracts*, Vol. XIV, Abst. 1284).

697. 633.853.74:581.162.32:578.08
LANGHAM, D. G. 633.853.74:575.115
Natural and controlled pollination in sesame.
J. Hered. 1944 : **35** : 255–56.

Sesame is conveniently pollinated after emasculating the flowers of the female parent by removal of the corolla and attached stamens, and covering both them and the flowers of the male parent

with gelatine capsules. Under natural conditions, 4·6% of the total seed set was found to follow cross-pollination, the principal agents being honey bees.
Hairy seedlings are dominant to glabrous.

698. Nesbitt, L. L. and
Painter, E. P. 633.854.54:581.6
Does linseed oil contain conjugated double bonds?
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1944 : **6** : No. 6 : 31–35.
Data are given on the Woburn and Wijs iodine numbers of the oil of linseed varieties.

699. C., C. 633.854.78:575.12:635.9
Les soleils annuels. (**Annual sunflowers**).
Rev. Hort. Suiss 1942 : **15** : 279–81.
Various races of *Helianthus annuus* are mentioned and the forms described include the ornamental hybrid obtained by crossing *H. annuus* with *H. Penticularis coronata*.

700. Beirnaert, A. and
Vanderweyen, R. 633.855.34:575.42:581.46
Les graines sélectionnées livrées par la station de Yangambi. (**Selected seed produced by the Yangambi Station**).
Publ. Inst. Agron. Congo Belge 1941 : Ser. Tech. No. 28 : Pp. 41.
A general account is given of the methods and technique of seed selection for oil palms employed at Yangambi. As it takes 7–8 years to produce élite seed it is necessary in the meantime to provide planters with as good and as reliable seed as possible and to this end certain rules and directions are formulated based on the experience of many years work on the oil palm.
R. M. I.

701. Beirnaert, A. and
Vanderweyen, R. 633.855.34:576.16:575.127.2:631.557
Influence de l'origine variétale sur les rendements. (**The influence of the varietal origin on yield**).
Publ. Inst. Agron. Congo Belge 1941 : Ser. Tech. No. 30 : Pp. 26.
As a result of experimental crosses between the three types of oil palm, *dura, tenera* and *pisifera*, the most productive cross was found to be *dura* x *pisifera* with a pure *tenera* progeny and a yield 15% greater than that of the cross *tenera* x *dura*, which in turn yielded 20% more than the cross *tenera* x *tenera* or *tenera* x *dura* (mother trees of *tenera* crossed alternately with *tenera* and *dura* pollen).
The least productive cross is *dura* x *dura* (or *dura* selfed).
The elimination of the sterile *pisifera* trees from the plantations was found to improve the yield of the neighbouring trees. R. M. I.

702. Cornell, D. S. 633.855.34:581.6
The African oil palm: its history, cultivation and importance.
Lloydia, Cincinnati 1944 : **7** : 101–20.
This general account of the African oil palm includes descriptions of varieties together with quality analyses of the fruits.

MEDICINAL PLANTS 633.88

703. Peacock, S. M. (jun.),
Leyerle, D. B. and 633.88:581.165.71:633.71:581.6
Dawson, R. F. 633.88:581.165.71:635.64:581.6
Alkaloid accumulation in reciprocal grafts of *Datura Stramonium* with tobacco and tomato.
Amer. J. Bot. 1944 : **31** : 463–66.

Dawson, R. F.
Translocation of hyoscyamine in *Datura Stramonium* L.
Ibid. 1944: **31**: No. 8: p. 9s. (Abst.).
Mydriatic alkaloids are found in the scion component of grafts of either tobacco or tomato on *D. Stramonium*. In the reciprocal grafts, no satisfactory evidence of mydriatic activity in the scion could be obtained. Nicotine is present in the scion of the graft *Datura* on tobacco. Alkaloids were detected in the sappy exudate from decapitated stems of *Datura*.

704. 633.885.1:581.162.5:575

Report of the Puerto Rico Experiment Station 1943 (1944) : Pp. 38.

Cinchona was found to be normally self-incompatible, and a study was made of cross-compatibility. A method of prolonging the viability of pollen is described.

RUBBER PLANTS 633.91

705. Rollins, R. C. 633.913:575.127.2

Analagous plant types from natural populations of guayule (*Parthenium argentatum*) and mariola (*P. incanum*), and certain derivatives of crosses between these species.

Amer. J. Bot. 1944 : **31** : No. 8 : 13s–14s. (Abst.).

Four types of guayule exhibiting various characteristics of mariola have been investigated. The "rough" type arises from back-crossing a balanced interspecific hybrid to guayule, the ovum being haploid; the "rough-aberrant" type from a guayule x mariola cross where the ovum is diploid; while the "normal" hybrid arises from the combination of haploid gametes from each parent. An "intermediate" type is also recognized. Hybrids derived from crossing a 72-chromosome plant of mariola with a guayule plant with three "36 +" chromosomes, resembled wild forms of presumed mariola.

706. Rollins, R. C. 633.913:575.127.2

Evidence for natural hybridity between guayule (*Parthenium argentatum*) and mariola (*Parthenium incanum*).

Amer. J. Bot. 1944 : **31** : 93–99.

Although the evidence for the hybrid nature of the plants described is circumstantial, it is nevertheless strong. Of primary significance is the fact that these plants are intermediate between mariola and guayule in nearly all morphological characters. The fact that similar hybrids appeared among the progeny of both guayule and mariola is considered as practically conclusive. Since the hybrids were obtained from cultures of several different types of guayule and originated in various widely separated locations in Texas and north-eastern Mexico, it must be presumed that crossing between guayule and mariola is fairly widespread in areas where both species occur. Evidence from the morphology of the trichomes is presented as the primary basis for the determination of the hybrids.

Preliminary investigation of the chromosomes in the hybrid plants has indicated that the meiotic processes are fairly regular. For the most part, the chromosomes associate as bivalents, but univalents and multivalent associations were invariably noted. Two hybrids had an approximate diploid number of 54, one of 63, three of 72, one of 81 and one of 90. Both guayule and mariola have a polyploid series of chromosomes. A sufficient range of chromosome numbers is present in the two species to account for the numbers that have been found in the hybrids.

707. Bergner, A. D. 633.913:576.312.35

Guayule plants with low chromosome numbers.

Science 1944 : **99** : 224–25.

An account is given of the cytology and meiotic behaviour of guayule plants collected from Texas and Durango, Mexico. Special attention was paid to the forms with 36–39 chromosomes which appear to be the normal type in certain localities in Durango but an off-type in Texas.

708. Esau, K. 633.913:581.163:581.162.3

Apomixis in guayule.

Proc. Nat. Acad. Sci. Wash. 1944 : **30** : 352–55.

Evidence is presented to support the conclusion that apomixis occurs in *Parthenium argentatum* through the direct development of the megaspore mother-cell into a uninucleate diploid embryosac. Meiosis may occur also and pollination appears to be necessary for the development both of the apomictic embryos and their endosperm.

709. Warmke, H. E. 633.913:581.6:576.356.5

The effect of tetraploidy on root weight and rubber content in the Russian dandelion.

Amer. J. Bot. 1944 : **31** : No. 8 : 6s–7s. (Abst.).

There is some evidence to suggest that tetraploid races of *Taraxacum Kok-saghyz* produce a higher rubber yield than the diploid.

710. DICKINSON, F. 634(51)
The introduction and propagation of fruit trees.
W. China Un. Univ. Agric. Sch. Agric. Res. Inst. 1943, May 22 : p. 1. (Mimeographed).

This publication mentions the work done in developing better varieties of apples, lemons and grapefruit.

711. LANTZ, H. L. 634:575
Fruit breeding contributes to better living.
N.S. Dak. Hort. 1944 : **17** : 142–44, 155, 160.

A popular account is presented of some of the achievements of fruit breeders.

712. LEMASSON, J. 634:575.1:581.162.5:576.356.5
La recherche de variétés fruitières nouvelles. Applications aux arbres fruitiers des principes de la génétique. (**The search for new fruit varieties. Applications of genetical principles to fruit trees**).
Rev. Hort., Paris 1943 : **115** : 378–79.

A general account of the bearing of Mendelian principles on the interpretation of the past development and future breeding of fruit varieties is presented. The importance of cytological investigations in elucidating the causes of sterility, e.g. in triploid apples, is indicated.

713. 634:577.16
Vitamin variation in fruits, plants, due chiefly to variety and sunlight.
Calif. Citrogr. 1944 : **29** : 128–29.

The factors determining the vitamin contents of plants are briefly considered. The importance of environmental factors is emphasized, also the need for adequate sampling techniques if varietal comparisons are to have any general application. When a variety has a significantly superior vitamin content, it should be utilized in a sound food economy.

714. HAAS, P. G. DE 634–1.524:575(43)
Über die Beziehungen zwischen Herkunft und Standort im Obstbau. (**On the relationships between source of planting material and locality in fruit growing**).
Kühn-Archiv 1943/44 : **60** : 189–203.

With the object of obtaining frost resistant fruit trees, growers are giving particular attention to the relation between origin and locality in choosing their varieties. The various meanings of the term "origin" (Herkunft), as used by German fruit growers, are defined and discussed under the following aspects in the light of the relevant literature and commercial usages: (1) ancestry, wild forms of fruit trees and their natural distribution, cultivated varieties and areas of distribution and local varieties and races; (2) provenance; (3) the maintenance of type purity in vegetatively produced clones, etc., and the importance of recognizing that aberrant characters in clones are not necessarily mutations; and (4) the locality from which nursery stock is drawn.
The distribution of varieties of fruit trees must in future be based on studies of cytology, genetics, morphology, and climate and soils, and not on the predominantly economic basis prevailing at the present time. Until this is achieved the main object, as regards origin of seed, maintenance of purity of vegetatively produced plants and nursery stocks, must be genotypically uniform, productive and sound plants. Environmental influences and nutritional, in particular, must also be studied.

715. HILKENBÄUMER, F. 634–2–1.521.6:575:578.08
Resistenzzüchtung bei Obstunterlagen. (**Breeding for resistance of stocks for fruit trees**).
Kühn-Archiv 1943/44 : **60** : 455–61.

In view of the relatively small amount of work that has been done on the above subject, the author gives a general outline of the recognized methods of plant breeding which should be applied to the selection and breeding of stocks resistant to frost, drought, pests and disease. Progress already made by German and other workers in this field with regard to various fruit trees occupies the main part of the paper.

716. Rubtsov, G. A. 634.1:576.16:582
Geographical distribution of the genus *Pyrus* and trends and factors in its evolution.
Amer. Nat. 1944 : **78** : 358–66.

The genus *Pyrus* is believed to have originated in Tertiary times or even earlier. A minimum of 35 species is recognized and two areas of specific diversity, viz. western Eurasia and eastern Asia. It is suggested that the genus first arose in the mountainous regions of western China which are exceptionally rich in representatives of the Pomoideae and Prunoideae. Dispersal is believed to have followed the lines of mountain chains, i.e. principally in the east and west directions; deserts, seas and snow-covered mountains are supposed to have acted as insuperable barriers.

An account is given of the evolutionary status of many of the species, and evidence is brought forward in favour of the hypothesis that evolutionary differentiation has been based primarily on the processes of "xerophytization" and "borealization". Finally, the important role played by hybridization in the genesis of new forms is considered.

717. Martin-Lecointe, G. 634.1:581.165.711:575.42
La sélection des sujets porte-greffes. (**The selection of individuals suitable as stocks**).
Rev. Hort., Paris 1943 : **115** : 377–78.

Descriptions are given of French apple and pear stocks and the synonomy of these with the Malling stocks is indicated. Selection work with these stocks is difficult owing to their genetical heterogeneity, and attention is therefore being directed to those forms which give rise to moderately uniform progenies.

718. Chasset, L. 634.11:575.22
La sélection des greffons. (**Selection of scions**).
Rev. Hort., Paris 1943 : **115** : p. 378.

A note is presented on the variability of apple scions, with special reference to the variety Belle de Boskoop.

719. Evreinoff, V.-A. 634.11:576.16:582
Notes sur l'origine botanique et génétique de nos arbres fruitiers. I.—Les pommiers. (**Notes on the botanical and genetical origin of our fruit trees. I. Apple trees**).
Rev. Hort., Paris 1944 : **116** : 11–13.

Taxonomic descriptions are given of *Malus sylvestris* Miller and *M. pumila* Miller, the two most important ancestral species of modern cultivated varieties. Other species that have contributed to the formation of economically important forms include *M. spectabilis* Borkhausen, *M. Pratii* Helmsley, *M. baccata* Borkhausen, *M. prunifolia* Borkhausen and *M. astracanica* Dumont de Courset. Notes on the phytogeography and ecological preferences of these species are also given.

720. 634.11:576.356.5(48.5)
Tetraploide Apfelbäume in Schweden. (**Tetraploid apple trees in Sweden**).
Schweiz. Z. Obst- u. Weinb. 1943 : **52** : p. 480. (From Hort. Abstr. 1943 : **13** : 1144).

"According to the journal *Obst und Gemüse* the tetraploid apple trees in the nurseries of Alnarp and Ramlöse, Sweden, have flowered for the first time. These trees were raised by Nilsson-Ehle for the production of triploid varieties".

721. Haller, M. H. and
Magness, J. R. 634.11–1.547.6(73)
Picking maturity of apples.
Circ. U.S. Dep. Agric. 1944 : No. 711 : Pp. 23

This circular includes the description of the characteristics of 21 varieties in relation to picking time.

722. Evreinoff, V.-A. 634.13:576.16:582
Notes sur l'origine botanique et génétique de nos arbes fruitiers. II.—Les poiriers. (**Notes on the botanical and genetical origin of our fruit trees. II. Pear trees**).
Rev. Hort., Paris 1944 : **116** : 18–19.

Notes on the taxonomy and geographical distribution of *Pyrus communis* L., *P. nivalis* Jaquin

and *P. serotina* Rehder are given. These three species are believed to be the principal ancestors of modern pear varieties; other less important ancestral species include *P. syriaca* Boiss., *P. ussuriensis* Maxim. and *P. longipes* Cosson et Durieu.

723. CHATOT, J. 634.13–2.111–1.521.6(44)
Remarques sur la résistance comparée de quelques variétés de poires à l'occasion des gelées printanières. (**Remarks on the comparative resistance of certain varieties of pears during spring frosts**).
Rev. Hort., Paris 1942 : **114** : p. 191.
Young fruits of Beurré Clairgeau and Duchesse d'Angoulême showed the highest resistance of all varieties observed.

724. EVREINOFF, V.-A. 634.2:576.16:582
Le prunier Japonais (*Prunus salicina* Lindl.) [**The Japanese plum (*P. salicina* Lindl.)**].
Rev. Hort., Paris 1943 : **115** : 296–98.
An account is given of the morphology, geographical origin and principal varieties of *P. salicina*. This species crosses readily with many other species of *Prunus* and has contributed to the genetical make-up of several modern plum varieties.

725. EVREINOFF, V.-A. 634.2:576.16:582
Notes sur l'origine botanique et génétique de nos arbres fruitiers. IV.—Le prunier. (**Notes on the botanical and genetical origin of our fruit trees. IV. The plum tree**).
Rev. Hort., Paris 1944 : **116** : 69–70.
The various theories relating to the origin of modern plum varieties are considered briefly and descriptions are given of *Prunus insititia* L. and *P. cerasifera* Ehrh., which are believed to be the more important ancestral species.

726. EVREINOFF, V.-A. 634.2:582(52)
Le prunier japonais (*Prunus salicina* Lindl.) son origine, ses variétés, sa culture. [**The Japanese plum (*P. salicina* Lindl.), its origin, varieties and cultivation**].
Rev. Hort., Paris 1943 : **115** : 307–10, 323–25.
A descriptive list of 67 hybrid and other varieties is given with notes on cultivation and a bibliography.

727. CONSTANTINESCU-ISMAIL, N. 634.22:581.162.5(49.8)
Contribuţiuni la studiul autofertilităţei şi interfertilităţei la diferitele varietaţi de pruni. (**Contributions to the study of self and interfertility in different plum varieties**).
Hort. Românească 1939 : **17** : No. 9/10 : 2–4.
Selfing and artificial pollination of bagged emasculated flowers of seventeen varieties of plum showed that Reine Claude Noire is completely self-sterile, Tuleu Gras almost self-sterile, with only 10% set or less from selfing; Bistriţa, Bosnia, Agen, Ana Späth, Quetsche d'Italie, Ontario, Queen Victoria and Muscata de Ungaria were self-fertile; no fruit was set from the combinations Bistriţa x Bosnia, Muscata de Ungaria x Bistriţa and Muscata de Ungaria x Reine Claude Noire. Good pollinators for Tuleu Gras are Bistriţa, Agen, Quetsche d'Italie and Reine Claude d'Althan and for Reine Claude Verde, Tuleu Gras, Bistriţa, Bosnia and Quetsche d'Italie.
No case of parthenocarpy was observed but xenia occurred in Tuleu Gras pollinated by Reine Claude d'Althan, the fruits being larger than usual.
In pollinations with pollen of *Prunus spinosa* the variety Agen set no fruit whilst Queen Victoria, Reine Claude Noire and Dulci de Ţuică did.
The full results are shown in tabular form.

728. EVREINOFF, V.-A. 634.25:576.16
Notes sur l'origine botanique et génétique de nos arbres fruitiers. III.—Le pêcher. (**Notes on the botanical and genetic origin of our fruit trees. III. The peach**).
Rev. Hort., Paris 1944 : **116** : 55–56.
The author discusses the phylogenetic relationships between various ancestral species of the peach and their relative importance. American, Russian, and other literature is cited.

729. Coe, F. M. 634.25–2.111(79.2)
Comparative hardiness of peach varieties and selections.
Fm Home Sci. Utah 1944 : **5** : p. 12.
This is the first report on the peach hardiness test orchard at Logan, Utah, and describes the extensive but variable injury of the trees during the winter of 1941–42. The hardiness rank of 55 peach and nectarine varieties and selections is tabled, the date referring only to the hardiness of the wood.

730. Fauvel, J. H. 634.3:576.16:582(54+59)
Les pays d'origine des espèces du genre *Citrus* et les contrées d'expansion en Extrême-Orient d'après le Professeur Tyôsaburo Tanaka. (**The countries of origin of the species of the genus *Citrus* and the countries to which it has spread in the Far East according to Professor Tyôsaburo Tanaka**).
Rev. Hort. Agric. Afrique Nord 1942 : **46** : 33–39.

Fauvel, J. H.
Les meilleurs Citrus d'Extrême-Orient. (**The best Citrus species from the Far East**).
Ibid. 1942 : **46** : 62–68.
In the first article Tanaka's views on the subject are cited and the importance of the eastern part of India and further India as centre of origin of the genus is stressed. A special section is devoted to the members of the sub-genus *Archicitrus*. The origin of different species in (or their migration to) China, Indo-China, Japan, Malaya and the Pacific Islands is also discussed.
In the second article, adapted by the author from Tanaka's original, the source and diversity of *Citrus* forms including separate notes on the Ponkan or the Swatow orange, the Tankan, the Kôshô-Tankan and the Haïli are briefly discussed.
There is also a short supplement by J. H. Fauvel on the Suhuikan mandarine (cf. *Plant Breeding Abstracts*, Vol. VIII, Abst. 1323).

731. Mauri, N. 634.37:582:578.088
Essais de mise au point d'une méthode pratique de détermination des variétés de figuier par mensuration du feuillage. (**Attempts to formulate a practical method of determining varieties of fig by leaf measurements**).
Rev. Hort. Agric. Afrique Nord 1943 : **47** : 8–11
This study, admittedly inconclusive, was based on 14,200 measurements made on 139 specimens representing 24 different varieties. Further studies to improve the method are planned.

732. Klein, J. 634.413:581.162.3:578.08
More and better cherimoyas.
Calif. Cultiv. 1943 : **90** : 274–75.
The technique of hand pollinating cherimoya flowers is described for the purpose of obtaining improved fruit sets.

733. Bertoni, G. T. 634.6(89)
El mbokayá o coco Paraguay (*Acrocomía totai* Mart.) [**Mbokayá or the Paraguay coconut (*A. totai* Mart.)**]
Rev. Minist. Agric. Comercio Industr., Paraguay 1941 : **1** : No. 4 : 36–50.
The leaves of this palm furnish an extremely nutritious fodder; the bases are used for salads; the epicarp of the fruit is also used for fodder, the pulp for human consumption and for stock, the mesocarp is used as fuel and the endocarp for oil; the kernel is also used for human consumption. Houses are built from the trunks. A useful fibre also is extracted from the leaves.
The present article gives an account of the systematics of the species, its geographical distribution, utilization, composition and cultivation.

734. Guillaumin, A. 634.65:582
Fructification de nouvelles espèces d'*Actinidia*. (**Fructification of new species of *Actinidia***).
Rev. Hort., Paris 1942 : **114** : 204–05.
A descriptive note is given of the fruits of *A. melandra* Franchet and *A. polygama* Franchet et Savatier which are earlier than *A. chinensis*. Their vitamin C content is not yet known.

735. 634.71:575(76.8)
DRAIN, B. D. 634.75:575(76.8)
Breeding for adaption of the strawberry and raspberry.
Trans. Ill. St. Hort. Soc. 1943 : **77** : 216–18.

A brief account is given of strawberry and raspberry breeding in Tennessee.

736. WALDO, G. F. and
WIEGAND, E. H. 634.71:581.6:575.127.2(79.5)
Two new varieties of blackberry the Pacific and the Cascade.
Sta. Circ. Ore. Agric. Exp. Sta. 1942 : No. 269 : Pp. 4. (Mimeographed).

Two new blackberry varieties are described. Pacific, from *Rubus macropetalus* var. Zielinski x a loganberry, has hermaphrodite flowers and long very dark red fruits; its flavour resembles that of *R. macropetalus* although the acidity is like that of a loganberry. Cascade, from the same cross, resembles Pacific but is more vigorous; the fruit is softer.

737. COE, F. M. 634.711:575(79.2)
Red raspberry varieties for freezing, local market, and home use.
Fm Home Sci. Utah 1944 : **5** : No. 2 : 3, 11.

This article includes descriptions of several recently introduced varieties. Taylor has large, high quality fruits which retain their superior flavour after freezing; Newburgh bears heavy fruits which weigh down the canes and facilitate picking; Washington has high quality fruits and is more winter-hardy than Cuthbert; Indian Summer is an "everbearing" raspberry with larger fruits than Ranere; Sodus is a heterotic purple-cane variety with larger, dull, purplish-red berries; while Marcy has large dark red and high flavoured berries but is susceptible to winter-killing.

738. BAIN, H. F. 634.76:576.356.5:581.04
Cranberry tetraploids.
Proc. 74th Annu. Conv. Amer. Cranberry G. Ass., Pemberton, N.J. 1943 : **74** : 12–13, 16.

Tetraploid strains of the cranberry varieties Centennial, Early Black, McFarlin and Searls have been obtained by the colchicine technique; partially tetraploid forms have been produced in the Howes and Vose's Pride varieties. These tetraploids are to be crossed with the moss-cranberry.

739. DERMEN, H. and
BAIN, H. F. 634.76:576.356.5:581.04
A general cytohistological study of colchicine polyploidy in cranberry.
Amer. J. Bot. 1944 : **31** : 451–63.

A detailed, illustrated account is given of the cytological and histological effects of colchicine on cranberry varieties. Polyploids and chimerical polyploids are readily produced.

FORESTRY 634.9

740. 634.9:575(48.5)
LINDQUIST, B. 634.975:576.16(48.5)
Die Rolle der Kiefer in der schwedischen Waldbaumveredelung.
(**The role of the pine in Swedish forest tree breeding**).
Z. wiss. tech. Fortschr. Forstw. 1942 : **18** : 293–302.

A general account is given of the history, organization and industrial applications of Swedish forest tree breeding, special emphasis being laid on the valuable properties of giant aspens. It has been assumed, with reference to pine races, that the narrow-crowned forms characterize the north of Sweden and the broad-crowned forms the south, but this is not so for both types may be found intermixed throughout the whole country. Descriptions are given of the narrow and broad-crowned races of southern Sweden and a comparison is drawn between the properties of these two types. Final sections describe the methods of tree breeding, including references to mother-tree selection, individual selection, hybridization, transgressive breeding and colchicine-induced polyploidy.

741. PEARSON, G. A. 634.97:575
Applied genetics in forestry.
Sci. Mon., N.Y. 1944 : **58** : 444–53.
Consideration is given to the possibilities of applying breeding methods to forest trees. Two systems are reviewed, firstly, the propagation of desirable hybrids, and secondly, the application of field selection techniques with special reference to methods of felling. The following selection criteria are discussed: persistence, vigour, growth, habit and timber quality.

742. ROHMEDER, E. 634.97:575(43)
Ergebnisse der forstlichen Saatgutforschung als Mittel zur Ertragssteigerung im Walde. (**Results of forestry research on seed as a means of increasing the yield in forests**).
Z. wiss. tech. Fortschr. Forstw. 1942 : **18** : 165–76.
This paper deals with various aspects of seed quality and germinability, also with the following topics of interest to plant breeders. The importance of provenance studies and the various patterns of racial distribution are stressed, for several important morphological and physiological characters may be affected. It is not true to suppose that provenance studies are only important in the pine and larch, for more recent work has shown their value in the case of spruce, fir, Douglas fir, alder, birch, beech and oak. Reference is made to the red and green coned forms of the spruce, also to the hazel spruce (Haselfichte), the special variety used in the manufacture of the Mittenwalder violins. This last-named form is described and a brief account given of experiments on its regeneration.
A final section deals with forest tree breeding. The difficulties involved are outlined and also some of the achievements of Wettstein with poplar hybrids. Breeding methods, and selection in particular, are shortly described.

743. JENSEN, H. 634.97:575:578.08
Modern teknik vid växtförädling med träd och buskar. (**Modern technique in plant breeding applied to trees and shrubs**).
Kungl. LantbruksAkad. Tidskr. 1943 : **82** : 330–40.
Various ways of accelerating the developmental rhythm of trees and shrubs and of inducing early and abundant flowering are fully discussed with notes on the writer's own experiments. Some specific reactions of different genera and species as well as of individual trees are mentioned.
The relative value of bark ringing and strangulation is considered at some length, so also are root pruning and transplanting, and the use of dwarf stocks to induce flowering is also discussed. Suitable dwarf forms, abnormally early and prolific in flowering, exist of some of the more important trees (pine, spruce, oak, ash and birch, etc.) which could be used as stocks in breeding operations. With the same object grafts have been tried with different species as the stock, e.g. grafts (at Ramlösa) of different types of aspen upon the very vigorous *Populus trichocarpa*, all of which flowered as 2–3 year old grafts. Possible reasons for the last named results are suggested. Another instance, of interest for forest tree breeding, is grafting of pronouncedly long day aspen on grey poplar (Gråpoppel) stocks of southern provenance; the grafts have produced annual shoots about 3 metres long and are growing vigorously in contrast to aspens from the same mother tree which, on the same ground and on their own roots, showed annual shoots a few decimetres long. This technique could be used to obtain more and better seed from extreme northern forms moved to southern districts.
In order to eliminate differences in length of day requirements and to induce early and profuse flowering, grafts have been made in the greenhouse between scions from many élite pines from different climatic regions of Sweden and stocks of the small southern *Pinus montana*. Similar work (involving over 1000 grafts) has been done *inter alia* with élite common spruce grafted on *Picea alba*.
The applications of these methods in the breeding and establishing of seed plantations of superior genotypes and the use of such plantations in hybridization work under conditions of open-pollination are evident.
Wettstein's method of crossing poplars by using flowering branches placed in water has been extensively applied to this genus at Ekebo, while for other genera the growing of small but prolifically flowering specimens in pots for use for controlled crosses in greenhouse has been preferred. Difficulties of grafting on species other than elm, ash and poplar have been successfully solved by the old bottle grafting method, tried first on birches and later (with necessary modifications) on other species of trees. Incidentally, vitamin B_1 in the water in the flask seems to promote union.

This method has been used successfully to preserve the valuable genotype of an élite, giant type spruce, that had been cut down by mistake and lain for five months buried in snow. The process is also being tried with other genetically valuable trees in similar circumstances.
Discussing polyploidy in conifers, the author refers to the record of a tetraploid *Sequoia sempervirens* and to Syrach-Larsen's triploid hybrid from a cross of *Larix europaea* and *L. occidentalis*. Colchicine treatment of quite a large amount of seed has resulted so far in two tetraploid forms, confirmed by Levan, one of *Thuja gigantea* and one of *Sequoia gigantea*; both these forms are described in detail. Judged by their external appearance, the five aberrant *Thuja gigantea* trees could have been taken for some southern cypress. On the other hand the tetraploid plants of *Sequoia gigantea* (from seed from America) show a definite increase in vigour, larger and coarser, almost succulent needles, thicker branches, and a darker blue-green colour than the diploid controls.
Colchicine treated spruce, pine and larch and Douglas fir have not yet been cytologically examined, but it is suggested that triploid and tetraploid forms of conifers may well occur spontaneously, especially among forms with the typical characteristics of polyploidy, such as needles, longer and thicker than normal, and thicker branches and greater vigour than usual. A survey of such forms should be made to be followed by cytological examination.
Among the numerous deciduous trees in which polyploids are recorded is *Prunus Laurocerasus* with 144 chromosomes (i.e. 18 times the basic number 8).
The respective value of triploid and tetraploid aspens is considered.
In work on chromosome reduplication the writer found that *Vaccinium* reacts more readily to sulphonamide than to colchicine; some gigas types of *Vaccinium* species are described though their chromosome number has not yet been determined. The ultimate object is to cross any tetraploids found with tetraploid American species, e.g. *V. corymbosum* and *V. pennsylvanicum*, to obtain new allotetraploid forms adapted to the Swedish climate and suitable for cultivation on bog-land and other poor soils. In referring to similar possibilities of improving other fruits, hybrid combinations between the tetraploid *Rubus caesius* (with 28 chromosomes), and tetraploid garden raspberry or the octoploid *R. Chamaemorus* (with 56 chromosomes) or the tetraploid of *R. arcticus*, when obtained, are suggested. Such crosses might lead to the production of new allopolyploid *Rubus* forms with completely new characters and possibly of great value for extreme conditions.
In the author's experience, tetraploids of *Fragaria vesca* obtained with colchicine showed very low fertility, in spite of abundant flowering. An attempt is being made to eliminate this defect by crossing the tetraploid with the octoploid horticultural garden strawberry, thus obtaining new completely fertile and economically valuable wild strawberry types which should be hexaploids with 42 chromosomes.

744. *Svoboda, P. 634.97:575.125:575.127.2
Křiženci lesních dřevin a cesty k jejich využití. (**Hybrids of forest trees and ways of utilizing them**).
Lesnicka Práce (Forestry Practice) 1940 : **19** : 373–408.

A detailed account is given of the interspecific hybrids of the following genera: *Taxus, Abies, Picea, Pinus, Salix, Populus, Betula, Alnus, Corylus, Ulmus, Juglans, Quercus, Sorbus, Tilia* and *Acer*. Special attention is paid to the heterotic combinations.

745. Florin, B. 634.97:575.42(48.5)
Stolp-huggning. Skona elitbestånd och elitträd. (**Post production. Spare élite stands and élite trees**).
Skogsägaren 1944 : No. 10 : 231–33.

The importance is made plain of a proper system of felling for posts in élite stands or stands containing élite trees so that individuals that are valuable for seed production for the new stands shall not be cut down. Excessive cutting for poles and posts impoverishes the stand and leads to a predominance of hereditarily inferior types which will pass on their undesirable features to the regenerated growth to which they give rise.
Race improvement should be promoted widely, as providing the breeder with material upon which high grade forest stands can be built up again.

* An abridged translation of this paper is on file at the Bureau.

746. 634.97:575.42(48.5)
W–N, J. M. 634.97–1.521.5(48.5)
Skogsdagar i Värmland. (**Forestry meetings in Värmland**).
Skogen 1944 : **31** : 279–81.

Representatives of the forest tree improvement movement met for excursions and deliberations, in the course of which the woodlands of the Billerud and Uddeholm companies were visited. The need for eliminating inferior types that might lower the quality of seed from nearby élite stands selected for seed production was emphasized. Many poor stands can be attributed to inferior uncertified seed from Germany. Official efforts were, however, made to ensure that good seed, suitable to the particular area to be planted, should be available for sylviculturists. A programme has been drawn up for the organization of breeding operations by (1) taking measures to ensure the preservation of élite trees for seed production at various altitudes and latitudes; (2) establishing new élite stands from tested progenies; and (3) by rearing scions of the best progeny-tested élites so that seed nurseries or plantations can be laid down for the production of extra high quality élite seed.

Registration of élites is also to be carried out. Measures for inducing seed setting have been undertaken.

Plans for the commercial disposal of improved seed from Ekebo and the other branch stations of the Association were discussed. The right way to deal with younger stands of inferior types growing in the midst of forests of high quality aroused some controversy; Prof. Sylvén suggested that in less extreme cases, before having recourse to felling, the times of flowering of the bad and the good stands should first be ascertained to establish whether pollination of the latter by the former is possible.

A resolution was passed calling for amendment of the existing law on felling, to permit the elimination of types with such undesirable hereditary features.

747. TIRÉN, L. 634.97–1.521.5:581.142:578.08(48.5)
Tallfröets grobarhet i Norrland. (**Germination capacity of pine seed in Norrland**).
Skogen 1944 : **31** : p. 365.

This paper has been reviewed in a previous issue. (See *Plant Breeding Abstracts*, Vol. XIV, Abst. **1318**.)

748. GROSSHEIM, A. A. 634.972.3:582
(**A new pyramidal poplar *Populus Schischkini***).
J. Bot. U.R.S.S. 1944 : **29** : p. 124.

The species is found in the southern part of Transcaucasia, and more rarely in the eastern. It belongs, with three other species, to a position between the Albidae and the Trepidae. It is, however, distinguishable from the other three species by reason of its pyramidal crown and certain characters of its leaves. I. Z.

749. JENSEN, H. W. 634.973:576.312.332
Heterochromosome formation in the genus Ilex.
Amer. Nat. 1944 : **78** : 375–79.

The meiotic behaviour of *Ilex decidua* Walt., *I. monticola* Gray, *I. opaca* Ait., *I. verticillata* (L.) Gray and *I. vomitoria* Ait. is described, special attention being devoted to the heterochromosomes found in all these species and to the consequent meiotic irregularities. The fact that these irregularities appear to be inherited without detriment to the fertility of the species is considered, and it is suggested that this condition may be accounted for in part by the fact that the tendency toward unisexuality and the advent of interspecific hybridization have probably coincided.

750. BEKETOVSKIĬ, D. N. 634.973:581.162.3:575.22
(**Some characteristics of the atypical form *Robinia pseudoacacia* L. var. *monophylla* Kirschn.**)
J. Bot. U.R.S.S. 1944 : **29** : 29–35.

Evidence has been brought forward by Koržinskiĭ and other investigators, to show that atypical forms of *R. Pseud-Acacia* L. are wanting in reproductive vigour, and are also in other respects handicapped in the struggle for survival. Although the author has himself confirmed the existence of such characters as failure of the seeds to reach maturity, few seeds per pod and poor germination, yet he proved that in the case of *R. Pseud-Acacia* L. var. *monophylla* Kirschn. these shortcomings are balanced by such characters as an ability for self-pollination, which the typical

form lacks; an average number of florets per inflorescence which is about equal to that in the typical form; and a higher proportion of seed set, as a result of self-pollination. It is pointed out, in conclusion, that the emergence of atypical forms, with their unstable complement of inherited characters, constitutes pliable material in the hands of the plant-breeder who, taking note of Mičurin's and Lysenko's observations, should not overlook the possibilities which such forms offer. I. Z.

751. Dayton, W. A. 634.973:582
Kelsey Locust, *Robinia kelseyi* Hort. ex Hutchins.
Amer. Midl. Nat. 1943 : **30** : 504–09.

The taxonomic status and correct naming of *R. Kelseyi* is discussed. The complex of species constituted by *R. Kelseyi*, *R. Boyntonii* Ashe, *R. hispida* L. and *R. viscosa* Vent. is a difficult group to elucidate and the criteria used to distinguish the named species are of doubtful validity.

752. Wright, J. W. 634.973–2.111–1.521.6:576.312.35:576.16(73)
Ecotypic differentiation in red ash.
J. For. 1944 : **42** : 591–97.

At least three ecotypes can be recognized within the species *Fraxinus pennsylvanica* Marsh., the distinguishing characters including winter hardiness and growth rate. The distinction between var. *typica* and var. *lanceolata*, which is based on the presence or absence of pubescence, is inconstant. The species appears to be uniformly diploid ($2n = 46$).

753. Wright, J. W. 634.973–2.111–1.521.6:576.356.5:576.16(73)
Genotypic variation in white ash.
J. For. 1944 : **42** : 489–95.

Three ecotypes, a northern, an intermediate and a southern, have been distinguished within the species *Fraxinus americana* L. These forms differ *inter se* in resistance to cold and also in morphological characters. Pubescence occurs frequently in the southern and intermediate ecotypes but there is no justification for segregating the pubescent trees as a separate species *F. biltmoreana* Beadle, since glabrous forms may give rise to pubescent offspring and vice versa. The northern ecotype is diploid ($2n = 46$) but the southern and intermediate forms are variable, diploid, tetraploid and hexaploid forms occurring. No correlation could be established between chromosome number and either morphological or physiological characters.

754. Geete, E. 634.975:575.061.1(48.5)
Ormgranar och deras förekomst. (**Worm spruces and their incidence**).
Skogen 1944 : **31** : 263–65.

Some descriptions of this interesting type of spruce and its inheritance are cited from the past records of Henrik Hesselman, Nils Sylvén and Nils Klein. Somewhat more recent accounts have also been collected on the probable hybridity of this spruce and on the incidence of some relatively large numbers together in certain districts of Sweden. Danish investigations on the subject are mentioned without details. Some illustrations are included.

755. 634.975:575.42(48.5)
Inventering av elitgranbestånd. (**Survey of élite spruce stands**).
Skogsägaren 1942 : **18** : 184–87.

For use in connexion with the spruce survey in Sweden, Professor Nils Sylvén here supplies information on (1) the well-known characteristics of the spruces and the comb spruce in particular and the inheritance of the comb habit; and (2) the way in which the survey of élite stands and trees is to be carried out (cf. *Plant Breeding Abstracts*, Vol. XIV, Abst. 643).

756. Schädelin, W. 634.975:576.16:581.162.3(49.4)
Ergebnisse der Lärchenforschungen von Prof. Dr. Ernst Münch und waldbauliche Folgerungen. (**Results of the larch investigations of Prof. Münch and its sylvicultural consequences**).
Schweiz. Z. Forstw. 1941 : **92** : 41–49, 67–79.

The first part of this paper gives an historical survey of early attempts to deal with the problems attending larch growing. The special contributions made by Münch to the subjects of larch pathology and the study of larch races are next considered, and then the geological history and racial diversification of the larch in Switzerland. Five racial groups are recognized: *I*, that characterizing the north-western alpine slopes from 5050 to 1000 m. above sea-level; *II*, a group in the same region but at an altitude of 1000 to 1700 m.; *III*, a group inhabiting the mountainous

region of the inner alps; *IV*, the forms found on the southern alpine slopes between an altitude of 1200 m. and the tree limit; and *V*, a group also characterizing the southern alps but growing below the 1200 m. contour. The natural variation within these groups is treated, special attention being devoted to the differences in micro-climate provided by the sunny and shady sides of the mountains, and the importance of wind currents in determining the extent of inter-racial cross-pollination.

757. Rubner, K. 634.975:581.143:576.16
Vorläufige Mitteilung über einen neuen Fichten-Provenienzversuch. (Preliminary communication on a new spruce provenance experiment).
Z. ges. Forstwesen 1944 : **76/70** : No. 1/6 : 28–32.

After a brief description of spruce races from various provenances, it is concluded that the higher altitudes support more slowly growing races than the lower. The altitude at which the change-over from fast to slow growing spruces may be said to occur is discussed, also the question whether these two classes of spruces are really distinct. It is difficult to decide whether a race with an intermediate growth rate should be recognized. The fast growing genotypes occupy an altitudinal zone, usually 300–400 m. in breadth, whose height above sea level varies according to the provenance. Data are also given on the relation between provenance and time of shooting.

758. Buchholz, J. T. 634.975:581.162.5:575.127.2
The cause of sterility in cross-pollinations between certain species of pines.
Amer. J. Bot. 1944 : **31** : No. 8 : p. 2s. (Abst.).

The causes of failure of normal seed development after interspecific cross-pollination in *Pinus* is classified under three headings: (*a*) disturbances prior to fertilization, (*b*) failure of the pollen tubes to effect fertilization, and (*c*) embryo abortion.

759. Bedwell, J. L. and Childs, T. W. 634.975–2.452–1.521.6
Susceptibility of white bark pine to blister rust in the Pacific Northwest.
J. For. 1943 : **41** : 904–12.

No proof could be obtained to support the theory that individuals or races of *Pinus albicaulis* Engelm. differ *inter se* in respect of their susceptibility to blister rust (*Cronartium ribicola* Fisch.) although some differences in the degree of infection of individual trees in a stand have been observed.

VEGETABLES 635

760. Barrons, K. C. 635:575(77.4)
New varieties for special crops.
Rep. Proc. 24th Annu. Conv. Mich. Muck Fmrs' Assoc. 1942 : 31–33.

Brussels sprouts
Selection has produced two strains more uniform in their ability to produce heads than the commercial varieties available.

Lettuce
A new strain named Great Lakes has been produced, which does well under Michigan conditions.

761. Pepkowitz, L. P., Larson, R. E., Gardner, J. and Owens, G. 635:577.16
The carotene and ascorbic acid concentration of vegetable varieties.
Plant Physiol. 1944 : **19** : 615–26.

A preliminary account of the matter of this paper has already appeared (*cf. Plant Breeding Abstracts*, Vol. XV, Abst. 373). Varietal differences in the content of ascorbic acid are reported for beet, pepper and peas, and in carotene for carrots. No significant varietal differences could be detected in the carotene content of beet, pepper or peas.

762. 635:581.162:575:578.08
BECKER, TH. 633.44:581.162:575:578.08
Blütenbiologische Studien an Zwiebeln, Möhren, Sellerie und Petersilie. (**Studies on the floral biology of onions, parsnips, celery and parsley**).
Kühn-Archiv 1943/44 : **60** : 466–92.

This report which deals only with *Allium* and the Umbelliferae is a record of an inquiry into (1) the most suitable methods of bagging or isolation of the particular seed plants; (2) how far emasculation combined with artificial or natural pollination is possible in practice; (3) the best and simplest methods of pollination; and (4) the possibility of controlling pollination.

763. BOSWELL, V. R. 635–2–1.521.6
Disease-resistant and hardy varieties of vegetables.
Nat. Hort. Mag. 1944 : **23** : 203–08.

Disease-resistant and hardy varieties of cucumber, melon, squashes and pumpkins are described.

764. NILSSON, F. 635.00.15(48.5)
Statens Trädgårdsförsök. (**State Horticultural Research**).
Fruktodlaren 1944 : No. 5 : 152–56.

An account is given of the origin, organization and facilities and staff placed at the disposal of the new institute (Statens Trädgårdsförsök) which took over part of the work of the Alnarp institute of vegetables and of the work on fruit begun by the Swedish Pomological Association (Sveriges Pomologiska Förening). The organization and range of the local experimental stations also established in connexion with the new institute are also outlined.

The aims of the research programme, which is both scientific and practical, are to deal with genetics, cytology, studies of chemical properties and the biology of flowering, variety trials, problems of quality and some plant breeding work.

Some of the crops for investigation at the different centres where each will be studied are mentioned.

765. CLARKE, A. E.,
JONES, H. A. and
LITTLE, T. M. 635.25:575.11.061.6
Inheritance of bulb color in the onion.
Genetics 1944 : **29** : 569–75.

Data on the development of pigment in the onion bulb are interpreted in this paper on the basis of three independent pairs of genes: (1) *C c*, a basic colour factor, the dominant *C* gene being necessary for the production of any pigment, all *cc* plants therefore producing white bulbs; (2) *R r*, the dominant *R* gene producing red pigment in the presence of *C*, while its allele *r* determines yellow pigmentation; and (3) *I i*, the dominant gene, an inhibitor, is partially dominant and producing white bulbs when homozygous. This scheme fits Riemans' data (1931) as well as did that author's multiple allele hypothesis and has the advantage of explaining the results observed in the F_1 and F_2 generations of certain yellow x recessive white crosses.

In one cross a correlation was found between colour and weight of bulbs, the white bulbs tending to be smaller than the coloured ones, suggesting either that the gene *I* is genetically linked with one or more growth factors or that this gene is directly responsible for smaller growth size.

766. JONES, H. A. and 635.25:581.162.5:575.182:575.11
DAVIS, G. N. 635.25:575.125
Inbreeding and heterosis and their relation to the development of new varieties of onions.
Tech. Bull. U.S. Dep. Agric. 1944 : No. 874 : Pp. 28.

When onion varieties are inbred, certain desirable factors such as non-bolting habit, keeping quality and morphological uniformity may be fixed, but, at the same time, there is a serious diminution in vegetative vigour. This loss may be restored by suitable crossing, heterotic F_1 plants sometimes exceeding in vigour the original unselected material.

Since emasculation is tedious, male-sterile lines have been used for hybridization. The variety Italian Red 13–53 is male-sterile but has the undesirable characters of late maturity and poor keeping quality. Its sterility is determined by the interaction of the cytoplasmic factor *S* and the double recessive gene combination *ms ms*. Plants with normal (*N*) cytoplasm or with the dominant gene *Ms* are male-fertile. By suitable back-crossing techniques, the male-sterility of Italian Red 13–53 has been transmitted to other commercial varieties which may then be used as female parents for hybridization without emasculation.

767. GRÈNE, G. 635.26:575.42(49.4)
Une culture d'ail sélectionné. (**A stand of selected garlic**).
Rev. Hort. Suisse 1941 : **14** : 323–24.
An illustrated note is presented on a selection of garlic which is remarkably vigorous and whose bulbils have no outer integument covering the clusters. The flavour is very delicate.
The breeder is E. Raymond, head gardener of the Hôpital de Porrentruy.

768. MILLER, J. C. 635.34:575.12(76.3)
Improved cabbage technique benefits trade.
Sth. Seedsman 1944 : **7** : No. 9 : 13, 38.
It is possible to accelerate cabbage breeding programmes by treating the plant as an annual. Seed is sown in July and during November and December the heads are cut and gathered for examination. The stumps of superior types are then transplanted to a seed plot and allowed to over-winter, all the sprouting shoots being removed except four or five which develop into compact rosettes. In March, flowering shoots emerge from these rosettes.
Two new varieties are also mentioned. Louisiana Copenhagen is an F_5 inbred of Copenhagen Market and is characterized by its short core and small to medium-sized heads.
Louisiana Allyear, from (Louisiana Copenhagen x Marion Market) x Charleston Wakefield, has the habit of Charleston Wakefield but the round heads of Louisiana Copenhagen; it is resistant to heat and cold.

769. SCHREIBER, F. 635.52:575
Erfahrungen über Salatzüchtung. (**Results in lettuce breeding**).
Kühn-Archiv 1943/44 : **60** : 462–65.
The original varieties of lettuce arose probably by hybridization or as mutations. Lettuce breeding is comparatively recent. The biology of the plant and the contributions of Bremer and Ernst-Schwarzenbach *inter alia* on its genetics and photoperiodic reactions are referred to (cf. *Plant Breeding Abstracts*, Vol. VI, Abst. 1422), though the writer disagrees with them on the latter subject, holding that the long-day response is the original reaction and that the recessive allelomorph conditioning indifference to length of day, arose under cultivation as a mutant which in the summer lettuce became fixed.
Crosses, made in the attempt to combine an attractive leaf colour with a good head, confirmed Ernst-Schwarzenbach's general findings on colour inheritance, except for the fact that in red crossed with green, dominance was incomplete and intermediate inheritance would seem to prevail. There are evidently a number of intensity factors for anthocyanin colouring, possibly representing an allelomorph series.
Some new colours and distribution of colour hitherto unknown in lettuce were found, e.g. some with almost scarlet leaves (due to full anthocyanin coloration on a yellow ground) and others with large red spots on the leaves.
The winter lettuces Schlettstädter, Nansen and Winterbutterkopf are being crossed with long-season early-headed lettuces to obtain a variety that can be grown at all times of the year combining a head that forms early and lasts long (as a result of indifference to length of day) and resistance to cold.
In breeding for resistance to *Bremia Lactucae*, *Sclerotinia sclerotiorum* and *Botrytis cinerea*, *Lactuca sativa* was reciprocally crossed with *L. Scariola*. Both crosses gave vigorous and completely fertile F_1 plants with an intermediate form of leaf and leaf rosette. From the abundant set of seed it is concluded that the chromosome complements are identical. It is further suggested that *L. Scariola* and *L. sativa* are not distinct species, but hold a position resembling that of *P. sativa* and *P. arvense*, and that the cultivated lettuce arose by mutation and selection from the wild *L. Scariola* with its many forms. In the F_2 of the above cross numerous types were observed, rosette formation predominating and the tendency to head formation being rare.
The results of hybridizations of *L. sativa* and *L. saligna*, *L. viminea*, *L. virosa* and *L. perennis* are not yet available.

770. WHITAKER, T. W. 635.52:575.061.633
The inheritance of chlorophyll deficiencies in cultivated lettuce.
J. Hered. 1944 : **35** : 317–20.
The phenotypic appearance and genetic behaviour of four chlorophyll deficiencies in lettuce are described. These cases proved to be cytoplasmic and transmitted by the maternal parent, and the other was apparently determined by a single recessive mutant gene.

771. Wohlers, C. 635.54:575:631.531.12
La sélection de la chicorée Witloof pour la graine. (**Selection of Witloof [Brussels] chicory for seed**).
Rev. Hort. Suisse 1942 : **15** : 65–66.
The process of selection and maintenance of pure pedigree lines is described for growers.

772. Russek, L. M. 635.6:581.163:581.04
Experimentos sobre partenocarpia. I. Solanáceas y Cucurbitáceas. (**Experiments on parthenocarpy. I. Solanaceae and Cucurbitaceae**).
Ciencia, Mexico, D.F., 1944 : **5** : 34–36.
Parthenocarpic fruits were obtained in *Lycopersicon esculentum, Physalis Coztomatl, Capsicum annuum, Cucumis sativus* and *Cucurbita Pepo* by treatment with indole-acetic acid, indole-butyric acid and napthalene-acetic acid. Concentrations of from 0·5 to 2·0% in lanoline were found to be most effective. J. G. H.

773. Pangalo, K. I. 635.61:582
[**A new genus of the *Cucurbitaceae, Praecitrullus* m.—an ancestor of the contemporary watermelon (*Citrullus* Forsk.)**].
J. Bot. U.R.S.S. 1944 : **29** : 200–04.
An examination of the anatomy and morphology of this species leads to the conclusion that it is a relic of an ancient genus from which the genera, *Citrullus* and *Cucumis*, of the present day subsequently sprang. The author therefore disagrees with the existing classification whereby this water-melon, occurring in north-western India, where the natives use it as a vegetable and a succulent fodder for cattle, is defined as *Citrullus vulgaris* var. *fistulosus*; and with the notion that it arose in what is now the Kalahari desert. He is of the opinion that its origin was in south-western Asia.
The plant is described in detail, and the new name for it recommended by the author is *Praecitrullus fistulosus* (Stocks) Pangalo comb. nov. I. Z.

774. Sinnott, E. W. 635.62:581.145.2:575.11
The relation between growth rate and fruit size in cucurbits.
Amer. J. Bot. 1944 : **31** : No. 8 : p. 5s. (Abst.).
Growth rate factors affecting the size of cucurbitaceous fruits segregate in the F_2 of crosses of inbred lines. Diploid and tetraploid races of the same line exhibited no signficant differences.

775. Cárdenas, M. 635.62:582:631.524(84)
Las cucurbitas cultivadas de Bolivia. (**The cultivated cucurbits of Bolivia**).
Rev. Agric. Bolivia 1944 : **2** : No. 2 : 3–12.
The author discusses the origin of the cultivated cucurbits and their distribution in North and South America. The three species cultivated in the U.S.A., *Cucurbita Pepo, C. moschata* and *C. maxima*, are also grown in Boliva. It is probable, however, that only the last named species is native to that country. J. G. H.

776. Wilson, J. D. and
Wilson, J. J. 635.63–2.8–1.521.6:575.12(77.1)
A mosaic-tolerant, pickling-type cucumber.
Bi-m. Bull. Ohio Agric. Exp. Sta. 1944 : **29** : 110–13.
Ohio **31**, an F_5 selection from Tokio Long Green x National Pickle, is a mosaic-tolerant pickling cucumber. The fruits are mahogany brown when mature and have thicker flesh than National Pickle.

777. Blaydes, G. W. 635.64:575.115.061.6:575.255
Chimeras of *Lycopersicon* and *Sanseveria*.
Amer. J. Bot. 1944 : **31** : No. 8 : p. 13s.
The note, beside referring to *Sanseveria trifasciata*, mentions a chimerical plant of the tomato variety Baltimore. A fruit was discovered bearing a yellow sector and from this yellow fruited progeny were raised. Hybridization experiments have demonstrated that yellow fruits are recessive to red.

778. Rick, C. M. 635.64:581.162.5:575.11:575.242
A new male-sterile mutant in the tomato.
Science 1944 : **99** : p. 543.

A male-sterile tomato is described which should be useful for the production of heterotic F_1 hybrid tomatoes by eliminating the need for emasculation. The male-sterility appears to be determined by a single recessive gene.

779. 635.64–2.3–1.521.6
Larson, R. H. 635.646–2.3–1.521.6
The ring rot bacterium in relation to tomato and eggplant.
J. Agric. Res. 1944 : **69** : 309–25.

Experiments on varietal susceptibility of tomatoes to ring rot [(*Corynebacterium sepedonicum* (Spieck. et Kotth.) Skapt. et Burkh.] are reported. No resistant varieties were discovered although differences in tolerance were observed. Most varieties of egg plant are also susceptible, including *Solanum integrifolium* Poir; Puerto Rican Beauty and E–12 are resistant.

780. Wallace, J. M. 635.64–2.8–1.521.6:615.37
Acquired immunity from curly top in tobacco and tomato.
J. Agric. Res. 1943 : **69** : 187–214.

By transferring a graft of Turkish tobacco, which had recovered from curly top infection, to tomato plants it was found possible to endow the latter with resistance to the virus. Such acquired resistance could be perpetuated during vegetative propagation. The reaction is strain specific and is thought to be analogous to the immunological reactions of animals.

781. 635.65:575(73)
Hastings, W. R. 635.67:575.12(73)
All-America awards.
Sth. Seedsman 1944 : **7** : No. 10 : 16–17, 40.

Several recently introduced varieties are described. Fordhook 242 (cf. *Plant Breeding Abstracts*, Vol. XIII, Abst. 1421) is a lima bean able to set its lower pods in hot, dry weather; Early Market, selected from Early Giant, is an early-maturing, bush lima bean; Florida Belle is a bush snap bean resistant to foliage diseases; Improved Commodore is a snap bean resembling the parent Commodore variety but has pods up to eight inches in length; while Goldengrain is a tall, yellow, hybrid sweet corn with large ears and 14–30 rows of kernels.

782. Kišpatić, J. 635.65–2.452:576.16:631.521.6
Einleitende Versuche über Rassenbildung bei *Uromyces fabae* (Pers.) de By.
[**Preliminary researches on race formation in *Uromyces fabae* (Pers.) de By**].
Phytopath. Z. 1943 : **14** : 475–83.

Evidence is presented to demonstrate that *U. Fabae* comprises a series of physiological races differing in respect of their pathogenicity to field beans. No bean variety was found to be immune to all the races and few were resistant. The most promising varieties are Butjadinger and Dr. Franck's Hohenloher. It was found that some varieties were heterozygous for disease resistance and it is suggested that more satisfactory forms of these varieties might be obtained by selection.

783. 635.655:575(44)
P....., P. 633.831:575:581.6(44)
Procès-verbal. Séance du 7 Décembre 1941. (**Report of Proceedings. Meeting of 7th December, 1941**).
Rev. Hort. Agric. Afrique Nord 1942 : **46** : 27–32.

Seed from a yellow variety of soya bean, bred at Châteauroux and sown in August, produced a crop in November.

Two ornamental pimentos with a hot taste, Chinois and Little Gem, on crossing with other garden varieties, produced various types, some of which bred true for colour. One of these with red conical fruits, broad at the base, has a very hot taste, while another identical in form and colour has a mild flavour.

784. ANDERSSON, G. 635.655:575.12(48.5)
Redogörelse för arbetena med soja vid Sveriges Utsädesförening åren 1941–1943. (**Report on the work with soya bean by the Swedish Seed Association 1941–43**).
Sverig. Utsädesfören. Tidskr 1944 : **54** : 279–93.

During 1941–43 work in Sweden on the soya bean has followed the lines previously laid down (cf. *Plant Breeding Abstracts*, Vol. XIII, Abst. 641), with the main emphasis, however, on hybridization.
Extensive studies were made on the most suitable localities for soya-bean growing and the best time for sowing. Most varieties gave highest yields when sown on 4 May, but two Riede strains, which are relatively early and practically long-day types, gave higher yields when sown on 15 May.
The photoperiodic response of different varieties was studied in experiments with artificial shade. The results should be of value in hybridization work from both the standpoint of the combination of desirable characters and the actual technique of crossing.
Inoculation experiments, recorded in some detail, gave contradictory results.
The two main aims in hybridization have been (1) to combine earliness with high yield and (2) to obtain types transgressive for earliness by crossing different early varieties.
The difficulties of crossing soya beans and various modifications introduced in the technique as a result of experience are described. Though two of the best varieties, Sv 38/66 and Sv 38/139 (obtained from Professor Riede), are the most difficult to cross, they were retained for breeding purposes because of their neutral (if not absolutely long-day) reaction and their earliness, yield and seed quality. The consequence of this was a low percentage set and fewer hybrid seeds, but more valuable hybrid material. The results so far obtained are discussed.
X-ray irradiation experiments, still in progress, have produced some morphological mutations (e.g. modification of the seed, anthocyanin production in the leaves at maturity) and also some mutants of practical importance, e.g. increased plant height and apparently an increased capacity of the seed to stand early sowing. No clear mutations affecting earliness have, however, been recorded yet with certainty.
Polyploidization as a practical method of improvement of the soya bean was given up in 1943, though the results are of theoretical interest.
In summarizing the results up to the present and future plans for soya bean improvement, it is pointed out that the promising strains (F_4 and F_5) of the valuable mutant forms and of the hybrid lines of value for their earliness require another four to five years or possibly ten years before they can be regarded as ready for practical cultivation.
As soon as world conditions permit, new breeding material (populations from suitable regions in the original area of cultivation of the soya bean and improved material from other institutes) must be acquired. Pure lines then obtained by selection in populations of segregating material must be used in hybridization, crosses being made on the largest possible scale. For successful research on this crop within reasonable time considerable resources, funds, equipment and facilities for experimentation are needed.

785. GRÉEN, S. 635.656:575(48.5)
Förändringar å ärtsortimentet. (**Changes in the available assortment of peas**).
Fruktodlaren 1944 : No. 3 : 99–101.

The place filled by marrow-fat, garden and sugar peas in the seasonal market requirements in Sweden is defined and the development, by breeding, of the marrow-fat pea with edible pods is described. The last named can also be used as an ordinary pea for shelling and both the pea and the pod have a fuller flavour than the sugar type. At present, breeding operations are directed to producing varieties differing in earliness and stringless types.
The *fasciata* type of pea from which new peas for preserving have been bred is illustrated.

786. CALDWELL, J. S. and CULPEPPER, C. W. 635.67:581.6(75.2)
Suitability for dehydration of 34 varieties and strains of sweet corn. Part IV.
Canner 1943 : **96** : No. 22 : 20–21, 28.

Yellow and white varieties of sweet maize were grown together at the Plant Industry Station,

Beltsville, Maryland. The varieties were graded in the dry condition into three groups, according to desirability as food products. The conditions evidently required for the best appearance and quality of dehydrated maize are discussed.

787. NELSON, R. 635.72–2.484–1.521.6:575.12
Progress in the control of peppermint wilt by resistance.
Rep. Proc. 24th Annu. Conv. Mich. Muck Fmrs' Ass. 1942 : 38–42.

A hybrid between peppermint and spearmint has shown a high degree of resistance to *Verticillium* wilt, and promising yield and quality of oil.

788. NELSON, R. 635.72–2.484–1.521.6:575.12
Present status of wilt-resistant hybrid mints and plans for their further development.
Proc. Mich. Muck Fmrs' Ass. 1943 : **25** : 38, 40.

Verticillium wilt-resistant peppermint x spearmint hybrids have been developed at the Michigan State College. Two seedlings show particular promise as potential substitutes of English peppermints, and exhibit a satisfactory resistance to wilt, favourable plant characters, high yields and a possible commercial value for their oils. Plantings of these two hybrids are being extended, and breeding work is being continued.

BOOK REVIEWS

WILKS, S. S. 519
Mathematical statistics.
Princeton University Press, N.J. 1943 : $3.75 : Pp. xi + 284.

The production of a text-book of mathematical statistics is an onerous task, which the author has here attempted with noteworthy success. His book is in fact one of the very few of its kind, and treats its subject in a very thorough and exhaustive manner.

Early reference is made to the theory of sets of points and Borel measureable functions under the most general conditions, more perhaps to give an idea of the rigorous background to the subject than for other reasons. At times, however, a precise formulation of unproved theorems in terms of these concepts is used in the logical development, an important example being the theorem giving a sufficient condition for the existence and uniqueness of a distribution given its moments. Much attention is given to distributions possessing a probability density function, the general method of attack making repeated use of moment generating functions. In view of the steady development of the subject, there is necessarily a good deal of back-referencing, also the notation may not be familiar on sight; it is, however, quite possible to understand one particular section of the work following the references given. There are a few misprints of an unimportant nature.

The general approach to the subject is abstract; in fact it is almost a theory of functions. No attempt is made to define randomness or probability, and a distribution function is introduced mathematically, its connexion with reality being merely the limiting form to which an empirical function appears to tend. Some theorems on general cumulative distribution functions are deduced, but scarcely used in the ensuing work. Regression functions are defined for the general many variable case. The binomial, multinomial, negative binomial and Poisson distributions are introduced, and the respective moments found from the moment generating functions. The Gaussian distribution is considered at first solely as an abstract distribution, but it is given significance later by the central limit theorem which is proved under certain conditions. The multivariate normal distribution brings in the first of the many pages devoted to transformation theory in linear algebra, and one wonders if mastrix notation could not have been used at this stage with possibly a greater freedom in the assuming of stock results. Pearson curves appear with no explanation or justification, but are at least accepted gracefully and used, which is more than can be said for the Gram-Charlier series. One extremely pleasant piece of work which may not be widely known is on distribution free tolerance limits, in which an estimate is made of the true proportion of an infinite population lying between two values derived from a random sample. For the normal distribution, certain of the stock allied distributions are derived, such as that of the means, of Student's "t" and of Snedecor F_1, the latter being Fisher's ratio in thin disguise. These are then used to provide confidence limits and tests of hypotheses where possible. Presumably a test based on a confidence region must have some form of optimum properties, but the subject is not pursued, even in the section on the Neyman Pearson theory. For point estimation, only the maximum likelihood method is supplied; and then the impression conveyed is that the optimum properties are, from one point of view, rather arbitrary. It is proved, however, that when certain conditions (which in practice are easily verifiable) are satisfied, that the estimates have in the limit a normal distribution about the true value with a certain minimum sampling variance property. What may be considered an omission in this section is the ignoring of what have been called "closest estimates". For the testing of statistical hypotheses, the Neyman Pearson approach is given, but an early mention of confidence intervals obscures the fact that the Neyman Pearson theory is completely general, and may be used for providing a test to satisfy any conditions (if such a test exists), and that among such tests will be those involving confidence intervals. It is in fact true to say that the confidence interval tests (if they exist) are best because they satisfy certain quality criteria laid down by Neyman and Pearson. The likelihood ratio test is introduced with no apology for arbitrariness, and is found very useful in later chapters. From chapter eight onwards, proofs are given of certain results fundamental to normal regression theory, that is of the situation where a statistical variate is distributed normally about a mean value which is a linear function of a set of variables. Precise clear phraseology may be difficult to find to define the situation, but one feels that the form actually adopted would have been less obscure if the word "variate" had been reserved for the statistical entity, and

"variable" for an entity regarded mathematically as the independent variable on which the variate depends. Whether or not the above independent variable is in fact a statistical variate is not relevant to how it is regarded in a particular context. The word "fixed" appears to indicate that an independent variable which takes one value in one experiment will take the same value in a replicated one. For the theory elaborated, the general outcome of a series of theorems is that F may be used to test linear hypotheses concerning the parameters in linear regression; this is applied to analysis of variance and the method of least squares. In chapter ten the theory of combinatorial analysis involving distributions arising from runs is presented, also matching theory, contingency tables and a very short survey of the Dodge Romig theory of sampling from finite populations. Sequential analysis is perhaps too recent a development to be found yet in a text-book. S. N. C.

AGAR, W. E. 57.1

A contribution to the theory of the living organism.

Melbourne University Press in association with Oxford University Press, Melbourne and London 1943 : 12s. 6d. : Pp. 207.

One of the most significant out of the many contributions that Professor Whitehead has made to present-day thought is his re-introduction to the scientific world of the Platonic tradition in philosophy. For some hundreds of years now, the philosophies deriving from Cartesian dualism, including both materialism and idealism, have been most to the fore, and since the time of Kant have been pre-occupied very largely with epistemological considerations. The relations between these philosophies and the empirical sciences have not always been cordial, and to-day it is still common to find scientists and philosophers eyeing each other with mutual distrust. Faults on both sides have undoubtedly contributed to this undesirable situation, which seems to have arisen, in part, through the small part allowed by recent philosophies to ontology and the elucidation of the nature of the external world. Scientists wishing to explore the philosophical implications of their findings have not found a helpful instrument in the contemporary philosophies, and have, in consequence, tended towards a rather unsatisfactory empiricism.

Yet the Platonic tradition with its comprehensive universality has never disappeared, and has remained as the *philosophia perennis* even when rendered unfashionable by other modes of thought. Its weakness, or rather the weakness of its exponents, has been the failure to represent it in relation to modern discoveries, a fault for which Professor Whitehead has made ample atonement. The sheer brilliancy of his exposition of the "philosophy of organism" has forced attention from scientists generally and biologists in particular, and several of the latter have endeavoured to work out the implication of his ideas with reference to particular biological systems.

Professor Agar's book is a noteworthy example in point, and although he derives also from other possibly discordant viewpoints, e.g. the Gestalt psychology, the pragmatic theory of truth and the neo-Darwinian evolutionary theory, his work is in the main an application of Whitehead's ideas to the special problems of biology. The close reasoning of his arguments and his careful definitions of the many peculiar terms of Whitehead's philosophy make it impossible to summarize his treatment and it is only possible to comment on one or two points.

The biological organism is regarded, in general, as a percipient subject, that is to say, as a subject able as a unified psycho-physical entity to establish causal relations with its external world. It is regarded also as a nexus of subordinate percipient subjects, the cells, and it is suggested that the tissues may form subjects of an intermediate status and that intracellular subjects may also exist. Of special importance is the author's emphasis on teleological or "purposive" action which is held to be demonstrable from studies on embryology and animal behaviour. It is believed that the end or "hormic goal" of these types of activity is itself a determining cause of the course of action involved. The "biological consequences" however of the tendency towards "hormic goals", e.g. the development of a perfect adult from an artificially modified embryo or the survival of a species through sexual activity, is not held to be teleologically explicable. Such far-reaching results of biological activity are explained, according to neo-Darwinian principles, as resultant from Natural Selection.

A close consideration is given to the relationship between physical and final causation. Following Whitehead, the author postulates the atomic nature of biological processes, both physical and mental. Since, however, each constituent element of process, or "event", must have a duration, it is suggested that final causation is operative while the "event" endures, whereas efficient physical causation determines the interaction between separate events.

The very obscure problem of the relation between enduring objects such as the biological organism and their constituent "events" is treated rather briefly and is hardly resolved by the notion that a new "event" *inherits* the subjective form of its predecessor. Another difficulty attends the understanding of the origin of the higher subject from its parts. It is stated that in the embryonic state, many organisms are merely aggregates of subjects, which only form a higher subject later by a process of "concrescence". If it is granted, as seems implied by the author's arguments, that the higher subject is more than the sum of its parts, its origin still remains to be accounted for, a very ancient problem in metaphysics.

The pioneer work of Professor Agar in elucidating fundamental biological problems in the light of such a profound philosophy as Professor Whitehead's can hardly be praised too highly, even although his exposition raises far more problems than it solves. Many of his theses are extremely controversial and it is clear that we are still only on the threshold of understanding the real significance of many biological processes.

For a botanist, this realization of incipience will be more acute, for plants achieve but two short paragraphs of attention, and are there degraded to the category of "living democracies". The denial of subjective, or in older terminology, substantial unity to the organisms of the Plant Kingdom is a challenge which botanical philosophers should be quick to accept.

Dobzhansky, T. and
Epling, C. 575.11

Contributions to the genetics, taxonomy, and ecology of *Drosophila pseudoobscura* and its relatives.

Publication Carnegie Institution of Washington, D.C. 1944 : No. 554 : Pp. iii + 183. figs. 4 plates. tables.

After the significance of the bands or discs in the giant chromosomes in the salivary glands of Drosophila had been elucidated by Painter, it became possible to study in detail, by direct observation of the order of the bands and of the pairing of sister chromosomes, the various chromosome structural rearrangements, natural or induced. In *D. pseudo-obscura* it was shown by Dobzhansky and Sturtevant that rearrangements produced by inversion of segments of the chromosomes occurred in wild populations. When more than two inversions had occurred in the same chromosome and the different inversions overlapped it was possible to make deductions about the order in which the inversions had occurred. As regards the gene arrangements found in the third chromosome, 21 different arrangements have been given their appropriate place in the phylogeny; there is also a hypothetical arrangement which has not been discovered.

The present bulletin is in three parts. The first part, by Dobzhansky and Epling, deals with the taxonomy, geographic distribution and ecology. The type previously referred to as *D. pseudo-obscura* race B is now given specific status under the name *D. persimilis*. Data are given from observation and experiment on geographic distribution, habitat and food, the attractive range of traps, diurnal periodicity of activity, seasonal cycles and migration. An important conclusion under the heading "migration" is that the observed rates of migration seem to be small enough to permit racial differentiation in populations residing only a few miles apart in a continuously inhabited territory.

The second and largest section, by Dobzhansky, deals with chromosomal races in *D. pseudo-obscura* and *D. persimilis*. It is impossible here even to summarize the conclusions drawn from the impressive amount of detailed work, involving the systematic examination of chromosomes from localities ranging from British Columbia to Guatemala and from California to Texas. There is abundant food for thought for all students of heredity, evolution and related topics. Perhaps the most fundamental of the conclusions refers to the concept of race. It is shown that only rarely is the population of a locality homogeneous with respect to gene arrangements in the third chromosome. From two to seven arrangements occur side by side and the relative frequencies of homozygotes and heterozygotes are in accordance with Hardy's formula for equilibrium. Nevertheless certain geographical regularities are evident in the distribution of the different gene arrangements. Races are defined as "populations of a species which differ in the incidence of one or more variable genes or chromosome structures".

The third section, by Epling, is called "The Historical Background". A hypothesis is elaborated of the history of the related species, starting with the progenitor of the whole *obscura* group, an inhabitant of the Arcto-Tertiary temperate forest. J. L. F.

BRIDGES, C. B. and 575.11
BREHME, K. S. (Editor) 575.243
The mutants of *Drosophila melanogaster.*
Publication Carnegie Institution of Washington, D.C. 1944 : No. 552 : Pp. vii + 257. 128 figs. 3 plates.

This monumental compilation is based on one made by the late Dr Calvin B. Bridges and published in 1938 as Drosophila Information Service 9. After his death in December, 1938, Katherine S. Brehme surveyed the Drosophila literature up to the end of 1942 and in consultaton with numerous investigators has produced the present list.

The list itself covers 225 pages and since there are about 14 references (including synonyms) per page it will be seen that it summarizes a tremendous amount of information. By the use of a carefully regulated system of nomenclature and symbolism it gives very succinctly the features which a Drosophila investigator wants to know about the different mutations and chromosome aberrations. Also provided are linkage maps of the most useful and less useful loci on the four chromosomes, salivary gland chromosome reference maps (reprinted from the *Journal of Heredity*) and a bibliography of C. B. Bridges. Numerous line drawings are included. The nomenclature and symbols are explained in detail. As a foreword, Professor T. H. Morgan provides a brief appreciation of the work of C. B. Bridges. J. L. F.

576.12
O'HANLON, M. E. 581
Fundamentals of plant science.
F. S. Crofts and Co., N.Y. 1941 : $4.25 : Pp. xi + 488. 268 figs.

The outstanding feature of this elementary text-book is that it appears to be written by a Catholic for Catholics. In dealing with evolution the characteristic outlook thus impressed on the book becomes most evident and we read that "the investigation of the theory of organic evolution is by no means condemned by the Church, provided only that the Christian hold to these two truths: first that the original matter of the universe . . . . was brought into existence 'out of nothingness' by the First Cause, God, the Creator who imposed upon this matter definite laws of development and change; and secondly that the soul of every human being . . . . is called into existence by a special creative act on the part of Almighty God Himself". A completely inadequate account of Darwin's work is given, and he is castigated for "his denial of purpose in evolution".

A quotation from Louis Agassiz (p. 18) illustrates another aspect of the author's outlook: ". . . . I say that the man of science who follows his studies into their practical application is false to his calling". The author appears to have taken this injunction seriously to heart; for example, after an account of the morphological features of stem rust of wheat, the whole inspiring story of the breeding of rust-resistant wheats in North America is dismissed thus: "Also, certain strains of wheat are found to be more resistant to its ravages than others".

The first part of the book deals with general botany and the second with special botany together with genetics, evolution and botanical history. The book is strongest on the purely morphological side and the accounts given in the text are generously supplemented by line drawings. More than the usual space is devoted to genetics. J. L. F.

SCHRADER, F. 576.353
Mitosis. The movements of chromosomes in cell division.
Columbia University Press, N.Y. 1944 : $2.00 : Pp. x + 110. 15 figs. 1 table.

Based mainly on the results of direct observation, Professor Schrader's monograph gives a detailed account of the structures to be observed in cells undergoing mitosis and then summarizes adequately and critically, though briefly, the different hypotheses which have from time to time been advanced to explain the movements of chromosomes at mitosis. The general approach is analytical rather than synthetical and some readers, especially on this side of the Atlantic, may complain that the author has paid too little attention to the comparative or, as it is sometimes called, "experimental" method. There is no doubt, however, that the book serves a very useful purpose in bringing together observations gathered over a very wide field and subjecting them to the scrutiny of an experienced cytologist. The diversity of the forces to which appeal has been made to account for chromosome movements is very striking and one can sympathize with the author who refrains at the present stage from attempting a synthesis. J. L. F.

WEATHERWAX, P. 581
Plant biology.
W. B. Saunders Company, Philadephia and London 1943 : 17s. : Pp. vi + 455. 182 figs. 1 table.

In recent years a number of elementary text books on botany have appeared, especially in the U.S.A., designed to avoid giving a mass of technical detail and to concentrate on giving a broad, general picture of plant life. Professor Weatherwax has produced a worthy example of this type of book. It is pleasantly written, concise and well illustrated and the author appears to have succeeded in his aim of keeping the living plant in the centre of the picture. Special botany is reduced to the minimum. Chapters are included on heredity and evolution. There are a few errors which should be corrected in future editions; we read, for example, that "cabbage, kohl rabi, cauliflower and Brussels sprouts have been produced from a single species of wild mustard".

J. L. F.

KRENKE, N. P. 581.143.26:581.149
(The theory of the cycle of senescence and rejuvenation of plants and its practical application).
Seljhozgiz, Moscow 1940 : Pp. 135.

The principles of dialectical materialism, on which this book is said by the late author to be based, are introduced in the first two pages by a series of quotations from Engels, Lenin, and Stalin. There is one quotation also from Darwin. The text which these quotations provide is then expanded, and the theory stated in its general form. It has hitherto been exemplified in the plant world but has been applied, so far to a limited degree, also to the animal world. According to the general theory the process of development in an organism is a struggle between senescence and rejuvenation until the inevitable death of the organism supervenes, senescence having won the struggle. During this struggle, while the allotted span of life pursues its inevitable decline, from the very moment of the organism's birth, rejuvenation periodically recurs. In the plant it is the formaton of new shoots and leaves. With each recurrence the character of the rejuvenation is seen to have changed; the leaves and shoots formed by the plant when it is young differ biochemically, physiologically and morphologically from those formed when it is old. Each leaf or shoot is therefore said to have two kinds of age: its own age, and that of the plant on which it is formed.

Most of the book consists of a short account by different investigators explaining how the theory has been applied to various crops in enabling early- or late-maturing varieties to be identified during the first part of a plant's life, in determining the best choice of material for vegetative propagation, or the best management in manuring and cultivation, with other useful and time-saving predictions. Each stage of senescence corresponds to a certain stage in the succession of changes which morphological or other easily discernible characters undergo. The leaf, for example, goes through a series of changes of shape and dimensions; the internodes increase in length at a rate characteristic for each variety. Both kinds of changes can be observed at an early period in a plant's growth, thus enabling the future course of its growth to be estimated.

I. Z.

CAIN, S. A. 581.9:576.1
Foundations of plant geography.
Harper and Brothers, N.Y. 1944 : $5.00 : Pp. xiv + 556. 32 tables. 63 figs.

This book is not a descriptive plant geography but a critical examination of the methods of study available to the modern plant geographer. It is a new type of book and one which badly needed writing, since few subjects have in the past suffered so much from loose and uncritical thinking. Apart from the introduction, the book is divided into four sections. The first, "Paleoecology", deals with the interpretation of fossil floras and includes a critical examination of the technique of pollen analysis. The second, "Areography", deals with the migration and dispersal of plants, endemism, species senescence, Age and Area, and other related topics. It includes an analysis of the various criteria which have been proposed to determine the centre of origin of a species. This will be of particular interest to plant breeders and others who have attempted to trace the origin of a cultivated plant on the lines suggested by Vavilov. The author appears to be in general agreement with Vavilov's principles, but points out particular cases in which they might not be valid.

The last two sections deal with evolution, speciation, and the significance of polyploidy in plant geography. The treatment is exhaustive and a very large number of recent contributions to the

subject are discussed. If one were to regard these sections merely as compilations they would be very valuable—the whole book is documented by no fewer than 720 references. In fact, the treatment is logical and connected and an attempt is made to arrive, where possible, at a small number of clearly stated general principles.

The book includes a glossary and an adequate index, also 63 figures, mostly clearly drawn distribution maps. It appears to be very free from errors and will prove a most useful reference book for all workers in plant geography or related fields. S. E.

FERNALD, M. L. and
KINSEY, A. C. 633(7)

Edible wild plants of eastern North America.

Idlewild Press, N.Y. 1943 : $3.00 : Pp. xiv + 452. 129 figs. 25 plates.

During several years of camping the authors have personally tested a large number of wild plants as a possible source of human food, and found many that provided tolerable, and in many cases attractive, food. They have also searched extensively the works of other writers upon the subject in various parts of America, Europe and eastern Asia, for the similarity and often the identity of plants in eastern North America, Japan, China and other Eastern Asiatic countries is well-known. This book presents their findings from both sources of knowledge, and is an illustrated guide to all the edible flowering plants and ferns, and some of the more important fungi, seaweeds and lichens of eastern North America, both as emergency foods and as a now neglected but readily available source of food which may furnish plants of future economic importance. The plants are grouped into different sections according to use, such as purées and soups, cooked green vegetables, salads, nibbles and relishes, syrups and sugars, table oils and butters, masticatories and chewing gums. Poisonous plants are fully described for the safe guidance of the uninformed or cautious. The greater part of the book is a systematic description of the forms and flowering plants found to be edible in various ways, and contains much detailed information, particularly of the uses of these plants by the American Indians and other primitive peoples and by explorers. The book provides a valuable and stimulating account of unusual plant foods, both for the reader sharing similar gastronomic enthusiasm and the plant breeder.

BAILEY, C. H. 633.11:664.641.016

The constituents of wheat and wheat products.

Reinhold Publishing Corporation, N.Y. 1944 : $6.50 : Pp. 332. 17 figs. 115 tables.

Professor Bailey's monograph forms one of the series of scientific and technological monographs sponsored by the American Chemical Society and is designed to serve as a guide and source of reference to the complex and massive literature on wheat chemistry. There are five chapters on proteins, one each on nucleic acid and non-protein nitrogen, three on carbohydrates and finally chapters on lipoids and sterols, minerals, the halogens, sulphur and selenium, acidity, wheat and flour pigments and vitamins.

While the book contains far more than is needed by the plant breeder, it will be a valuable addition to the library of the wheat breeder. J. L. F.

*TRAVIN, I. S. and
ŠČERBAČEVA, V. D. 633.321:575(47)

(Red clover).

O.G.I.Z. "Seljhozgiz" Moscow, 1941 : Pp. 392.

This monograph, dealing with red clover cultivation in Russia in all its aspects (cf. *Herbage Abstracts*, Vo. 15, Abst. 416) contains an extensive chapter on breeding. The development of red clover breeding in the U.S.S.R. is described historically. Breeders are required to produce different types according to the differing conditions of cultivation and utilization in the different areas where the crop is grown; eight of these areas, and the type required in them, are briefly described. There follows an account of the existing diversity of red clover varieties and groups and their geographical distribution. The exceedingly narrow ecological specialization of the many existing local types, even in countries where red clover has been introduced comparatively recently, is emphasized. The various characters used in distinguishing forms are enumerated and a résumé is given of the information on their genetical behaviour, according to the published literature. The authors' results have mostly been in conformity with Lysenko's view-point, i.e. "dominance is displayed by the character and quality which, in the given set of conditions, has

* An extended summary of the section on breeding is on file at the Bureau.

the greatest possibility of being developed". Floral biology and questions of sterility are considered in some detail, and breeders are urged to include high fertility among the qualities aimed at in producing varieties, so as to ensure heavy and reliable yields of seed.

Neither inbreeding nor close breeding are regarded as worthy of attention as practical breeding methods.. Uniformity of type can be attained without loss of vigour by selecting a small number, even two, promising mother plants, multiplying them vegetatively and intercrossing them for seed production. Hybridization is regarded as the most promising method of improvement at present. Interspecific crossing has not yet given any practical results but might do so if applied on a mass scale, say with the use of insects. Family or group selection rather than individual plant selection is recommended as the basis of practical breeding work, so that the plants grow as nearly as possible under farm conditions. One of the best methods of improvement has been selection for definite physiological types.

"Free crossing" and "limited crossing" are described as methods most commonly used for the production of varieties among cross-pollinated plants. In clover the method of "limited crossing" has been applied in intravarietal hybridization. In this method poor families are removed before flowering begins, and thus contamination of superior families by their pollen is prevented. The necessity is stressed of working with only one form in a variety or at least in a single direction, otherwise an undesirable and often very variegated mixture of plants is obtained. Among the various possible forms of restricted pollination the "halves" or "remainder" method has been extensively applied.

The production of new varieties by means of both free and restricted inter-varietal crossing was studied by the author at the Nosov experiment station during 1927-30. The purpose of the former method has been to increase the resistance of the clover crop, particularly to cold. The data obtained from restricted intervarietal crossing show that this method merits careful study and practical application in the breeding of cross-pollinating fodder plants. The main advantages of the authors' method of inter-varietal crossing are as follows: (1) selection of a variety takes place under normal farming conditions; (2) artificial selection is combined with natural, and during the process of systematically crossing the best plants and best forms desirable agricultural properties of many varieties are combined and accumulated in one variety; (3) the breeder also utilizes heterosis whenever it occurs; (4) not only small inheritable variations are utilized, but also the large and more constant generic variations; (5) breeding and propagation can be much hastened because each variety has from the beginning a considerable number of seeds.

The method of repeated back-crossing used in the improvement of a variety is illustrated. The method of diallel crosses between individual plants, whole families or varieties, is also described, and the advantages in the case of families or varieties are discussed.

In conclusion it is pointed out that in the production of a variety, the methods of forming it are closely connected with the various preceding methods of selection; furthermore the methods of formation themselves are various. The combinations possible between methods of selection and the methods of forming a variety which are most practicable or which have been applied in clover breeding are usefully tabulated.

LUNDIN, Y. 634

Hemträdgårdens frukter och bär. (**Horticultural fruits and berries**).

Sveriges Pomologiska Förening, Stockholm 1944 : Kr. 4 : Pp. 131. illus.

This hand book issued under the auspices of the Swedish Pomological Association (Sveriges Pomologiska Förening) is intended as an aid to the domestic grower in the selection of varieties of fruit to replace those destroyed in Sweden by the recent series of severe winters. Excellent coloured lithograph illustrations by G. W: son Cronquist and descriptions of different varieties of fruits, berries and nuts are accompanied by illustrated instructions on various aspects of cultivation, a map showing the zones of cultivation in Sweden for fruits and berries, tabulated data on ripening, keeping quality, and suitable pollinators for different varieties of various fruits. A good subject index and a table of contents concludes the pamphlet upon whose publication the author can be cordially congratulated.

SYLVÉN, N. 634.97:575(48.5)

Svensk Skogsträdsförädling. Riktlinjer och önskemål. (**Swedish forest tree breeding. Lines of work and objectives**).

Stockholm 1943 : Pp. 53. 43 figs.

The main substance of this monograph has already been reviewed in *Plant Breeding Abstracts*, Vol. XIV, Abst. 318. Some new illustrations are included.

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